

Data Evaluation Report on the Toxicity of Clarity 4.0 SL (AI: Dicamba) to Terrestrial Vascular Plants: Vegetative Vigor

PMRA Submission Number {.....}

EPA MRID Number 47815102

Data Requirement:	PMRA Data Code:	9.8.4 (TGAI) or 9.8.6 (EP)
	EPA DP Barcode:	317697
	OECD Data Point:	IIA 8.12 (TGAI) and IIIA 10.8.1.1 (EP)
	EPA Guideline:	850.4250

Test material: Clarity 4.0 SL (AI: Dicamba)**Purity:** 40.3% w/w

Common name

Chemical name: IUPAC 3,6-dichloro-o-anisic acid

CAS name 3,6-dichloro-2-methoxybenzoic acid

CAS No. 1918-00-9

Synonyms BAS 183 09 H

Primary Reviewer: Michael Wagman

{EPA/OECD/PMRA}

Signature:**Date:** 3/15/11**Secondary Reviewer(s):** Brian Kiernan

{EPA/OECD/PMRA}

Signature:**Date:** 3/15/11**Reference/Submission No.:** {.....}**Company Code** {.....} [For PMRA]**Active Code** {.....} [For PMRA]**Use Site Category:** {.....} [For PMRA]**EPA PC Code** 029801**Date Evaluation Completed:** {dd-mm-yyyy}

CITATION: Porch, J.R., Krueger, H.O., Kendall, T.Z., and Holmes, C. 2009. BAS 183 09 H (Clarity): A toxicity test to determine the effects of the test substance on vegetative vigor of ten species of plants. Unpublished study performed by Wildlife International, Ltd., Easton, Maryland. Laboratory study no.: 147-236. Study sponsored by BASF Corporation, Research Triangle Park, North Carolina. Sponsor study no.: 358586. Study completed June 30, 2009.

EXECUTIVE SUMMARY:

The effect of **Clarity 4.0 SL (AI: Dicamba)** on the vegetative vigor of monocot (corn, *Zea mays*; onion, *Allium cepa*; ryegrass, *Lolium perenne*; and wheat, *Triticum aestivum*) and dicot (cabbage, *Brassica oleracea*; carrot, *Daucus carota*; lettuce, *Lactuca sativa*; oilseed rape, *Brassica napus*; soybean, *Glycine max*; and tomato, *Lycopersicon esculentum*) crops was studied at nominal concentrations of 0 (negative control), 4.0, 8.0, 16, 32, and 64 fl. oz. form/A (corn, onion, ryegrass, and wheat); 0 (negative control), 0.0082, 0.025, 0.074, 0.22, 0.37, and 2.0 fl. oz. form/A (lettuce, soybean, and tomato); and 0 (negative control), 0.26, 0.79, 2.4, 7.1, 21, and 64 fl. oz. form/A (cabbage, carrot, and oilseed rape). Equivalent concentrations expressed in terms of the acid equivalent Dicamba were 0 (negative control), 0.13, 0.26, 0.51, 1.0, and 2.0 lbs ae/A



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(corn, onion, ryegrass, and wheat); 0 (negative control), 0.00026, 0.00080, 0.0024, 0.0070, 0.012, and 0.064 lbs ae/A (lettuce, soybean, and tomato); and 0 (negative control), 0.0083, 0.025, 0.077, 0.228, 0.67, and 2.0 lbs ae/A (cabbage, carrot, and oilseed rape).

Measured test concentrations were <0.0178 (<LOQ, controls), 0.125, 0.260, 0.515, 1.02, and 2.02 lbs ae/A (corn, onion, ryegrass, and wheat); <0.0178 (<LOQ, controls), 0.000261, 0.000751, 0.00227, 0.00676, 0.0196, and 0.0602 lbs ae/A (soybean and tomato); <0.0178 (<LOQ, controls), 0.00816, 0.0241, 0.0703, 0.215, 0.647, and 2.07 lbs ae/A (cabbage and carrot); <0.0183 (<LOQ, controls), 0.000262, 0.000766, 0.00225, 0.00697, 0.0210, and 0.0646 lbs ae/A (lettuce); and <0.0183 (<LOQ, controls), 0.00851, 0.0254, 0.0739, 0.222, 0.661, and 2.08 lbs ae/A (oilseed rape). A surfactant and adjuvant was added to the spray solutions. This is considered part of the test material for an end-use product where it is recommended for use on the label. A surfactant, adjuvant and water alone treatment was included in the study, but this is not considered a control for the study.

The growth medium used in the vegetative vigor test was artificial soil (sandy loam, pH 6.0, organic carbon 0.9%). On day 21 the surviving plants per pot were recorded and cut at soil level for measuring the plant height and dry weight.

Survival, dry weight and height were significantly affected in all dicot and some monocot crops.

The most sensitive monocot species was onion, based on dry weight, with EC₀₅ and EC₂₅ values of 0.137 and 0.472 lbs ae/A, respectively. The most sensitive dicot species was soybean, based on height, with EC₀₅ and EC₂₅ values of 0.000013 and 0.000513 lbs ae/A, respectively. For onion, the NOAEC was above the EC₂₅, therefore the EC₀₅ should be used in risk assessment, in place of the NOAEC. For soybean, significant inhibition was exhibited at the lowest test level, therefore, the calculated EC₀₅ value should be used in risk assessments.

Phytotoxic effects included leaf curl, stem curl, chlorosis, and necrosis. There were no effects on ryegrass. Corn had scattered, mild effects that did not appear to be treatment-related. There were moderate effects on wheat. Soybean and onion experienced moderately severe effects. Cabbage, carrot, lettuce, oilseed rape, and tomato experienced severe effects. Species that were affected exhibited a dose-response relationship.

Maximum Labeled Rate: Not reported

Results Synopsis

Acid equivalent

Monocot

EC ₅₀ /IC ₅₀ : 1.12 lbs ae/A	95% C.I.: 0.690-1.80 lbs ae/A
EC ₂₅ /IC ₂₅ : 0.472 lbs ae/A	95% C.I.: 0.200-1.11 lbs ae/A
EC ₀₅ /IC ₀₅ : 0.137 lbs ae/A	95% C.I.: 0.02896--0.6441 lbs ae/A
NOAEC: N/A	
Slope: 1.80	95% C.I.: 1.13-4.50
Most sensitive monocot: Onion	
Most sensitive parameter: Dry weight	

Dicot

EC ₅₀ /IC ₅₀ : 0.00670 lbs ae/A	95% C.I.: 0.00411-0.0109 lbs ae/A
EC ₂₅ /IC ₂₅ : 0.000513 lbs ae/A	95% C.I.: 0.00022--0.00117 lbs ae/A
EC ₀₅ /IC ₀₅ : 0.000013 lbs ae/A	95% C.I.: 0.000003-- 0.000053 lbs ae/A
NOAEC: <0.000261 lbs ae/A	

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Slope: 0.605 95% C.I.: 0.514-0.735

Most sensitive dicot: Soybean

Most sensitive parameter: Height

This toxicity study is classified as supplemental and does not satisfy the guideline requirement for a Tier II vegetative vigor toxicity study. This is due to a decrease in lettuce growth in controls between day 14 and day 21 measurements. Plants in controls should exhibit growth throughout the duration of the study. This is a major source of uncertainty in the study. This study is upgradeable to acceptable if acceptable data on lettuce is submitted. Data endpoints for the other nine species may be quantitatively used in risk assessments, but endpoints for lettuce should not be used.

Table 1 (Tier II studies). Summary of most sensitive parameters by species (lbs ae/A).

Species	Endpoint	NOAEC ¹	EC ₂₅	EC ₅₀
Corn	None	2.02	>2.02	>2.02
Onion	Dry weight	0.137 ²	0.472	1.12
Ryegrass	None	2.02	>2.02	>2.02
Wheat	Dry weight	0.0833 ²	0.491	1.68
Cabbage	Dry weight	0.0241	0.695	1.51
Carrot	Dry weight	0.00362 ²	0.0657	0.493
Lettuce	Dry weight	N/A ³	N/A ³	N/A ³
Oilseed rape	Dry weight	0.0739	0.498	1.08
Soybean	Height	0.000013 ²	0.000513	0.00670
Tomato	Dry weight	0.000132 ²	0.000886	0.00333

¹EC₀₅ used when NOAEC undefined/not suitable for risk assessment.

²EC₀₅ presented in place of NOAEC.

³Lettuce had unacceptable data. No acceptable endpoints for lettuce are available.

I. MATERIALS AND METHODS

GUIDELINE FOLLOWED: The methods used in conducting this study were based on procedures specified in the U.S. Environmental Protection Agency Series 850 – Ecological Effects Test Guidelines OPPTS Number 850.4150 and 850.4250. Deviations were noted:

1. The cation exchange capacity and moisture of the soil were not reported.
2. The lowest readings of % relative humidity ranged from 10.9 to 20.5%; OPPTS guidelines suggest that relative humidity range from 70 ± 5% during light periods and 90% during dark periods. While the study authors did not report when the humidity readings were taken, the lower values greatly exceed light and dark recommendations. Corn, onion, ryegrass, and wheat relative humidity was a maximum of 78.6%; this value is above the recommended range for light periods, and is below the recommended range for dark periods. All other species had maximum relative humidity ranges of 90.5 to 92.6%; these values are acceptable for dark periods, but are above the recommended maxima for light periods.
3. Temperatures ranged from 14.7 to 32.7°C for corn, onion, ryegrass, wheat, cabbage, and carrot; OPPTS guidelines suggest day temperatures of 25 ± 3°C and night temperatures of 20 ± 3°C. The study authors did not differentiate between day and night temperatures; however, the lowest temperatures reported are lower than either the day or night

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recommendations, and the highest temperatures are higher than the recommended maxima for day and night.

4. Soybean, tomato, lettuce, and oilseed rape temperatures ranged from 17.2 to 35.7°C; the lowest value was within the acceptable lower end of the range of night temperatures, but was not within the acceptable range of day temperatures. The maximum temperature was well above the acceptable maxima for day and night temperatures.
5. Only five plants per replicate unit were tested; OPPTS guidelines suggest that 10 plants per replicate be tested. However, 6 replicates were used, instead of the guideline recommended 3.
6. Lettuce growth in the negative control was -9% between day 14 and day 21 measurements. Lettuce growth in the surfactant and adjuvant with water only treatment was also -6%. Plants in controls should exhibit growth throughout the duration of the study. This is a major source of uncertainty in the study.

These deviations did impact the acceptability of the study. This study is considered supplemental due to decreased growth of lettuce plants in controls. Data endpoints for the other nine species may be quantitatively used in risk assessments, but endpoints for lettuce should not be used. Continuation studies on lettuce are recommended. This study may be upgraded if acceptable data on lettuce is submitted.

COMPLIANCE:

Signed and dated GLP, Quality Assurance and No Data Confidentiality statements were provided. The study was conducted in compliance with Good Laboratory Practice standards as published by the EPA in 40 CFR Part 160 (1989), OECD Principles of GLP (ENV/MC/CHEM(98)17), and Japan MAFF, 11 NohSan, Notification No. 6283 (1999), with the following exception:

Periodic analyses of soil and water for potential contaminants were not performed according to GLP standards, but were performed using a certified laboratory and standard EPA analytical methods.

A. MATERIALS:

1. Test Material

Clarity 4.0 SL (AI: Dicamba)

Description:

Liquid

Lot No./Batch No. :

7054B01BJ

Purity:

40.3% ae w/w

Stability of compound under test conditions:

Analytical verifications performed at the three different test initiation days (February 12, April 30, and May 14) yielded recoveries ranging from 91 to 102% of nominal test concentrations. (*OECD recommends chemical stability in water and light*)

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Storage conditions of test chemicals:

The test material, both components of the adjuvant, and the analytical standard were stored at ambient room conditions without exposure to sunlight.

Table 2. Physical/chemical properties of Clarity 4.0 SL (AI: Dicamba).

Parameter	Values	Comments
Water solubility at 20EC	Not reported	
Vapor pressure	Not reported	
UV absorption	Not reported	
pKa	Not reported	
Kow	Not reported	

2. Test organism:

Monocotyledonous species: Corn (*Zea mays*, Poaceae; Nothstine Dent), Onion (*Allium cepa*, Liliaceae; WI 3115), Ryegrass (*Lolium perenne*, Poaceae; Gator 3), and Wheat (*Triticum aestivum*, Poaceae; Alsen); *EPA recommends four monocots in two families, including corn.*

Dicotyledonous species: Cabbage (*Brassica oleracea*, Brassicaceae; Late Flat Dutch), Carrot (*Daucus carota*, Fabaceae; Scarlet Nantes), Lettuce (*Lactuca sativa*, Asteraceae; Summertime), Oilseed Rape (*Brassica napus*, Brassicaceae; Dwarf Essex), Soybean (*Glycine max*, Fabaceae; Williams 82), and Tomato (*Lycopersicon esculentum*, Solanaceae; Rutgers); *EPA recommends six dicots in four families, including soybean and a root crop.*

OECD recommends a minimum of three species selected for testing, at least one from each of the following categories: Category 1: ryegrass, rice, oat, wheat, and sorghum; Category 2: mustard, rape, radish, turnip, and Chinese cabbage; Category 3: vetch, mung bean, red clover, fenugreek, lettuce, and cress.

Seed source: Corn and wheat obtained from Johnny's Selected Seeds, Winslow, ME; onion obtained from Wannamaker Seeds, St. Matthews, SC; ryegrass, cabbage, carrot, and tomato obtained from The Meyer Seed Co., Baltimore, MD; lettuce obtained from Territorial Seed Co., Cottage Grove, OR; oilseed rape obtained from Seedland Inc., Wellborn, FL, and soybean obtained from Missouri Foundation Seeds, Columbia, MO.

Prior seed treatment/sterilization: Seeds were not treated with fungicides, insecticides, or repellents prior to test initiation.

Historical % germination of seed: Corn, 90%; onion, >85%; ryegrass, 90%; wheat, 96%; cabbage, 85%; carrot, 80%; lettuce, 98%; oilseed rape, 85%; soybean, 98%, and tomato, 80%.

Seed storage, if any: None reported.

B. STUDY DESIGN:

1. Experimental Conditions

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- a. Limit test: N/A This test was conducted as a Tier II test.
- b. Range-finding study A range-finding study was not reported.
- c. Definitive Study

Table 3: Experimental Parameters - Vegetative Vigor

Parameters	Vegetative Vigor	
	Details	Remarks
		<i>Criteria</i>
Duration of the test	21 days	<i>Recommended test duration is 14-21 days.</i>
Number of seeds/plants replicate	5 plants per replicate unit	<i>Five plants per replicate are recommended.</i>
Number of plants retained after thinning	Thinning not performed	
Number of replicates		
Control:	6	<i>Four replicates per dose are recommended</i>
Adjuvant control:	6	
Treated:	6	

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Parameters	Vegetative Vigor	
	Details	Remarks
		<i>Criteria</i>
	<p>lbs ae/A</p> <p><u>Cabbage and carrot:</u></p> <p><0.0178 (<LOQ, controls), 0.00816, 0.0241, 0.0703, 0.215, 0.647, and 2.07 lbs ae/A</p> <p><u>Lettuce:</u></p> <p><0.0183 (<LOQ, controls), 0.000262, 0.000766, 0.00225, 0.00697, 0.0210, and 0.0646 lbs ae/A</p> <p><u>Oilseed rape:</u></p> <p><0.0183 (<LOQ, controls), 0.00851, 0.0254, 0.0739, 0.222, 0.661, and 2.08 lbs ae/A</p>	
<p><u>Method and interval of analytical verification</u></p> <p>LOQ:</p> <p>LOD:</p>	<p>Samples taken from each control and test level at test initiation and calibration standards were analyzed concurrently using HPLC with UV detection (235 nm).</p> <p>100 mg ai/L</p> <p>Set at the lowest analytical standard analyzed</p>	
Adjuvant (type, percentage, if used)	Non-ionic surfactant at 0.125% v:v and diammonium sulfate at 14 g/l	
<p><u>Test container (pot)</u></p> <p>Size/Volume</p> <p>Material: (glass/polystyrene)</p>	<p>11 cm diameter; 10 cm depth</p> <p>Plastic</p>	<p><i>Non-porous containers should be used.</i></p> <p><i>OECD recommends that non-porous plastic or glazed pots be used.</i></p>
Growth facility	Greenhouse	
Method/depth of seeding	The seeding method was not reported; corn, wheat, and soybean planted at depths of 20 mm; all other species planted at depths of 6 mm.	
<u>Test material application</u>		

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Parameters	Vegetative Vigor	
	Details	Remarks
		<i>Criteria</i>
Application time including the plant growth stage Number of application Application interval Method of application	Test material was applied directly on seedlings with 2 to 5 open leaves. 1 N/A; single application Applied using an overhead DeVries Research Tracksprayer equipped with a moveable spray nozzle suspended 41 cm above the target.	
<u>Details of soil used</u> Geographic location Depth of soil collection Soil texture % sand % silt % clay pH: % organic carbon CEC Moisture at 1/3 atm (%)	N/A; artificial soil composed of kaolinite clay, industrial quartz sand and peat, with limestone added N/A Sandy loam 67 13 20 6.0 0.9% Not reported Not reported	Organic matter: 1.5% <i>EPA prefers soil mixes containing sandy loam, loam, or clay loam soil with no greater than 2% organic matter. Glass beads, rock wool, and 100% acid washed sand are not preferred.</i> <i>OECD prefers the soil to be sieved (0.5 cm) to remove coarse fragments. Carbon content should not exceed 1.5% (3% organic matter). Fine particles (under 20um) makeup should be between 10 and 20%. The recommended pH is between 5.0 and 7.5.</i>
Details of nutrient medium, if used	N/A	
<u>Watering regime and schedules</u> Water source/type: Volume applied: Interval of application: Method of application:	Well water from the greenhouse. Not reported. Every 1 to 4 days. The plants were bottom-watered using subirrigation trays.	<i>EPA prefers that under foliage watering or bottom watering be utilized for vegetative vigor studies so that the chemical is not washed out of the soil during the test.</i>

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Parameters	Vegetative Vigor	
	Details	Remarks
		<i>Criteria</i>
Any pest control method/fertilization, if used		
<u>Test conditions</u> Temperature: Photoperiod: Light intensity and quality: Relative humidity:	Corn, onion, ryegrass, and wheat: 14.7-31.6°C Soybean and tomato: 18.2-35.7°C Cabbage and carrot: 16.4-32.7°C Lettuce and oilseed rape: 17.2-32.3°C 16L:8D High pressure sodium lighting used to supplement natural sunlight. Corn, onion, ryegrass, and wheat: 11.9-16.4 moles PAR Soybean and tomato: 11.0-16.4 moles PAR Cabbage and carrot: 10.4-14.7 moles PAR Lettuce and oilseed rape: 6.0-13.1 moles PAR Corn, onion, ryegrass, and wheat: 10.9-78.6% Soybean and tomato: 15.7-90.5% Cabbage and carrot: 20.5-91.8% Lettuce and oilseed rape: 20.1-92.6%	<hr/> <i>EPA prefers that the cold vs warm loving plants be tested in two separate groups to optimize plant growth.</i> <i>OECD prefers that the temperature, humidity and light conditions be suitable for maintaining normal growth of each species for the test period.</i>

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Parameters	Vegetative Vigor	
	Details	Remarks
		<i>Criteria</i>
Reference chemical (if used) Name: Concentrations:	N/A	
Other parameters, if any	None	

2. Observations:

Table 4: Observation Parameters - Vegetative Vigor

Parameters	Vegetative Vigor	
	Details	Remarks
Parameters measured (i.e., plant height, dry weight or other endpoints)	<ul style="list-style-type: none"> - Survival - Phytotoxicity - Dry weight - Height 	
Measurement technique for each parameter	Survival and phytotoxicity were determined visually. Height was measured with a ruler to the nearest whole centimeter from the soil surface to the apical meristem or to the tip of the tallest leaf. Dry weight was taken after the shoots of all living seedlings in a replicate were dried and weighed as a group (the weight of each replicate was divided by the number of seedlings).	
Observation intervals	Phytotoxicity and height were measured weekly. Survival and dry weight were determined at study termination.	
Other observations, if any	None	
Were raw data included?	Yes	

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Phytotoxicity rating system, if used	0- No effect; 10-30- Slight effect; 40-60- Moderate effect; 70-90- Severe effect; 100- Complete effect	Frans, Robert E. and Ronald E. Talbert. 1977. Design of Field Experiments and the Measurement and Analysis of Plant Responses. Pages 15-23 in B. Truelove, ed. Research Methods in Weed Science. Southern Weed Science Society, Auburn University, Alabama.
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II. RESULTS and DISCUSSION:

A. INHIBITORY EFFECTS:

Vegetative Vigor:

Survival was 100% in the negative controls and surfactant and adjuvant with water only treatments. There were no inhibitions in survival for corn, ryegrass, and wheat. Soybean had a maximum inhibition in survival of 3%. Cabbage, onion, and lettuce had maximum inhibitions ranging from 27 to 40%. Carrot, oilseed rape, and tomato had maximum inhibitions ranging from 70 to 93%. Carrot inhibitions demonstrated a dose-response relationship.

There was actual promotion in height for ryegrass, with a maximum inhibition of -4%, and corn experienced only 1% inhibition in height. Carrot, wheat, lettuce, and cabbage had maximum inhibitions ranging from 15 to 24%. Onion and oilseed rape had inhibitions of 31 and 38%, respectively. Soybean and tomato had maximum inhibitions of 67 and 75%, respectively; both exhibited a dose-response relationship.

There was promotion of dry weight for corn, with a maximum inhibition of -5%, and ryegrass experienced only 1% inhibition in dry weight. Wheat, cabbage, carrot, lettuce, and onion had inhibitions ranging from 52 to 68%. Soybean, oilseed rape, and tomato had inhibitions ranging from 74 to 89%. All species except corn and ryegrass exhibited a dose-response relationship.

Based on the study authors' results, the most sensitive monocot species was onion, based on dry weight, with NOAEC and EC₂₅ values of 8.0 and 12.7 fl. oz form/A, respectively, which are equivalent to 0.26 and 0.41 lbs ae/A. The most sensitive dicot species was soybean, based on height, with NOAEC and EC₂₅ values of 0.0082 and 0.0194 fl. oz form/A, respectively, which are equivalent to 0.00026 and 0.00062 lbs ae/A.

Phytotoxic effects included leaf curl, stem curl, chlorosis, and necrosis. There were no effects on ryegrass. Corn had scattered, mild effects that did not appear to be treatment-related. There were moderate effects on wheat. Soybean and onion experienced moderately severe effects. Cabbage, carrot, lettuce, oilseed rape, and tomato experienced severe effects. Species that were affected exhibited a dose-response relationship.

B. REPORTED STATISTICS:

Survival, dry weight, and height data were assessed. The study authors did not report comparing the negative and adjuvant control groups to evaluate potential effects of the adjuvant. The study authors pooled the control groups and used the pooled controls for all statistical analyses. The LOAEC and NOAEC values were determined using Dunnett's t-test via the DUNNETT option of the GLM (general linear model) procedure of SAS version 8 ($\alpha = 0.05$). Estimates of the EC_x values and their confidence limits were determined using the non-linear regression analysis of Bruce and Versteeg when reductions in endpoints among one or more treatment groups were 25% or more relative to the control means. These analyses were conducted using the NLIN

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procedure of SAS. The study authors reported toxicity values in terms of nominal concentrations of fl. oz form/A, and reported the most sensitive endpoints in terms of fl. oz form/A and lbs ae/A. The reviewer had to convert fl. oz form/A to lbs ae/A for all toxicity values for reporting in Tables 5 through 5c. Due to this conversion, toxicity values will be slightly different from those reported by the study author for the summary tables of the most sensitive endpoints.

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Table 5: Reported effect of Clarity 4.0 SL (AI: Dicamba) on Vegetative Vigor

Species	Results summary for biomass (lbs ae/A)						
	Weight (g)	NOAEC	EC ₂₅	95%CI	EC ₅₀	95%CI	LOAEC
Corn	1.00-1.23	2.1	>2.1	N/A	>2.1	N/A	>2.1
Onion	0.04-0.15	0.26	0.41	N/A	1.0	N/A	0.51
Ryegrass	0.70-0.92	2.1	>2.1	N/A	>2.1	N/A	>2.1
Wheat	0.45-0.96	0.26	0.53	N/A	1.8	N/A	0.51
Cabbage	1.70-4.62	0.025	0.72	N/A	1.5	N/A	0.077
Carrot	0.50-1.28	0.025	0.084	N/A	0.71	N/A	0.077
Lettuce	1.68-4.89	0.0024	0.020	N/A	0.043	N/A	0.0071
Oilseed rape	1.08-4.23	0.077	0.50	N/A	1.1	N/A	0.23
Soybean	1.86-7.21	0.00080	0.0021	N/A	0.011	N/A	0.0024
Tomato	0.74-7.26	0.00026	0.00092	N/A	0.0038	N/A	0.00080

Table 5a: Reported effect of Clarity 4.0 SL (AI: Dicamba) on Vegetative Vigor

Species	Results summary for height (lbs ae/A)						
	Height (cm)	NOAEC	EC ₂₅	95%CI	EC ₅₀	95%CI	LOAEC
Corn	52-56	2.1	>2.1	N/A	>2.1	N/A	>2.1
Onion	18-26	0.51	1.1	N/A	>2.1	N/A	1.0
Ryegrass	22-23	2.1	>2.1	N/A	>2.1	N/A	>2.1
Wheat	36-44	0.26	>2.1	N/A	>2.1	N/A	0.51
Cabbage	17-23	0.67	>2.1	N/A	>2.1	N/A	2.1
Carrot	27-35	0.23	>2.1	N/A	>2.1	N/A	0.67
Lettuce	11-18	0.021	0.063	N/A	>0.064	N/A	0.064
Oilseed rape	17-30	0.67	1.3	N/A	>2.1	N/A	2.1
Soybean	18-54	0.00026	0.00062	N/A	0.0079	N/A	0.00080
Tomato	11-44	0.0024	0.0030	N/A	0.011	N/A	0.0071

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PMRA Submission Number {.....}

EPA MRID Number 47815102

* provide the range

Table 5b: Reported effect of Clarity 4.0 SL (AI: Dicamba) on Vegetative Vigor

Species	Results summary for survival (lbs ae/A)						
	%	NOAEC	EC ₂₅	95%CI	EC ₅₀	95%CI	LOAEC
Corn	100	2.1	>2.1	N/A	>2.1	N/A	>2.1
Onion	63-100	0.51	1.1	N/A	>2.1	N/A	1.0
Ryegrass	100	2.1	>2.1	N/A	>2.1	N/A	>2.1
Wheat	100	2.1	>2.1	N/A	>2.1	N/A	>2.1
Cabbage	73-100	0.67	2.0	N/A	>2.1	N/A	2.1
Carrot	7-100	0.23	0.44	N/A	0.71	N/A	0.67
Lettuce	60-100	0.021	0.058	N/A	>0.064	N/A	0.064
Oilseed rape	30-100	0.23	0.90	N/A	1.4	N/A	0.67
Soybean	97-100	0.064	>0.064	N/A	>0.064	N/A	>0.064
Tomato	13-100	0.0071	0.025	N/A	0.036	N/A	0.021

Plant Injury Index											
Control	Corn	Onion	Ryegrass	Wheat	Cabbage	Carrot	Lettuce	Oilseed rape	Soybean	Tomato	Adjuvant control
0-2	0-18	2.92	0	0-36	2-88	2-100	0-90	0-96	6-76	8-100	0-4

0- No effect; 10-30- Slight effect; 40-60- Moderate effect; 70-90- Severe effect; 100- Complete effect

C. VERIFICATION OF STATISTICAL RESULTS BY THE REVIEWER:

Statistical Method(s): All analyses were conducted using the negative control only. Analysis was conducted using Sprouts, a SAS program provided by EFED/OPP/USEPA, in SAS version 9. All endpoints for which replicate data were provided were examined graphically using graphs to determine if they exhibited a dose-dependent response, which was ultimately used to select the multiple comparison tests to detect the NOAEC. Data for each endpoint were tested to determine if their distributions were normal and if their variances were homogeneous using Shapiro-Wilk's and Levene's tests, respectively. Data that satisfied these assumptions were subjected to Dunnett's and William's tests and data that did not satisfy these assumptions were subjected to the non-parametric MannWhitney-U and Jonckheere's tests. T-tests were performed to compare the control and surfactant and adjuvant only treatments if the 95% confidence intervals did not overlap upon visual examinations of the Sprouts output in SAS.

All analyses were conducted using the measured reviewer-converted application rates of lbs acid equivalent per acre (lbs ae/A).

Data Evaluation Report on the Toxicity of Clarity 4.0 SL (AI: Dicamba) to Terrestrial Vascular Plants: Vegetative Vigor

PMRA Submission Number {.....}

EPA MRID Number 47815102

Table 6: Effect of Clarity 4.0 SL (AI: Dicamba) on Vegetative Vigor

Species	Results summary for biomass (lbs ac/A)									
	Weight (g)	NOAEC	EC ₀₅	95%CI	EC ₂₅	95%CI	EC ₅₀	95%CI	slope	95%CI
Corn	1.00-1.23	2.02	>2.02	N/A	>2.02	N/A	>2.02	N/A	N/A	N/A
Onion	0.04-0.15	0.515	0.137	0.02896--0.6441	0.472	0.200-1.11	1.12	0.690-1.80	1.80	1.13-4.50
Ryegrass	0.70-0.92	2.02	>2.02	N/A	>2.02	N/A	>2.02	N/A	N/A	N/A
Wheat	0.45-0.96	0.26	0.083327	0.03171--0.21897	0.491	0.305-0.791	1.68	1.28004--2.213427	1.26	0.968-1.81
Cabbage	1.70-4.62	0.0241	0.227	0.119-0.433	0.695	0.501-0.964	1.51	1.26-1.81	2.00	1.53-2.89
Carrot	0.50-1.28	<0.00816	0.00362	0.00053-0.02476	0.0657	0.0243-0.178	0.493	0.278-0.876	0.771	0.570-1.189
Lettuce	1.68-4.89	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Oilseed rape	1.08-4.23	0.0739	0.164	0.0833-0.323	0.498	0.341-0.728	1.08	0.866-1.34	2.01	1.56-2.84
Soybean	1.86-7.21	<0.000261	0.000121	0.000030--0.000488	0.00160	0.000702-0.00364	0.00960	0.00589-0.0157	0.866	0.700-1.13
Tomato	0.74-7.26	<0.000261	0.000132	0.000044--0.000393	0.000886	0.000442-0.00178	0.00333	0.00212-0.00524	1.17	0.957-1.51

NC=Not calculable

Data Evaluation Report on the Toxicity of Clarity 4.0 SL (AI: Dicamba) to Terrestrial Vascular Plants: Vegetative Vigor

PMRA Submission Number {.....}

EPA MRID Number 47815102

Table 6a: Effect of Clarity 4.0 SL (AI: Dicamba) on Vegetative Vigor

Species	Results summary for height (lbs ae/A)									
	Height (cm)	NOAEC	EC ₀₅	95%CI	EC ₂₅	95%CI	EC ₅₀	95%CI	slope	95%CI
Corn	52-56	2.02	>2.02	N/A	>2.02	N/A	>2.02	N/A	N/A	N/A
Onion	18-26	0.515	0.08812	0.00496-- 1.5645	1.04	0.35593-- 3.03932	>2.02	N/A	0.905	0.482-7.49
Ryegrass	22-23	2.02	>2.02	N/A	>2.02	N/A	>2.02	N/A	N/A	N/A
Wheat	36-44	0.26	0.534	0.269-1.063	>2.02	N/A	>2.02	N/A	1.21	0.821-2.28
Cabbage	17-23	0.647	NC	N/A	NC	N/A	NC	N/A	N/A	N/A
Carrot	27-35	0.215	NC	N/A	NC	N/A	NC	N/A	NC	N/A
Lettuce	11-18	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Oilseed rape	17-30	0.661	0.529	0.286-0.976	1.33	1.06-1.68	>2.08	N/A	2.41	1.67-4.38
Soybean	18-54	<0.000261	0.000013	0.000003-- 0.000053	0.000513	0.00022-- 0.00117	0.00670	0.00411- 0.0109	0.605	0.514-0.735
Tomato	11-44	0.000751	0.000577	0.000255- 0.001305	0.00290	0.00179- 0.00470	0.00891	0.00666- 0.0119	1.38	1.13-1.78

NC=Not calculable

Data Evaluation Report on the Toxicity of Clarity 4.0 SL (AI: Dicamba) to Terrestrial Vascular Plants: Vegetative Vigor

PMRA Submission Number {.....}

EPA MRID Number 47815102

Table 6b: Effect of Clarity 4.0 SL (AI: Dicamba) on Vegetative Vigor

Species	Results summary for survival (lbs ae/A)									
	%	NOAEC	EC ₀₅	95%CI	EC ₂₅	95%CI	EC ₅₀	95%CI	slope	95%CI
Corn	100	2.02	>2.02	N/A	>2.02	N/A	>2.02	N/A	N/A	N/A
Onion	63-100	0.26	0.404	0.165-0.602	1.19	0.858-1.78	2.52	NC	117	13.2-1031
Ryegrass	100	2.02	>2.02	N/A	>2.02	N/A	>2.02	N/A	N/A	N/A
Wheat	100	2.02	>2.02	N/A	>2.02	N/A	>2.02	N/A	N/A	N/A
Cabbage	73-100	0.647	NC	N/A	NC	N/A	NC	N/A	NC	N/A
Carrot	7-100	0.0703	0.133	0.0688-0.200	0.332	0.227-0.442	0.625	0.471-0.852	282	55.0-1451
Lettuce	60-100	N/A	N/A	N/A	N/A	N/A	N/A	N/A	NC	N/A
Oilseed rape	30-100	0.222	0.474	0.235-0.670	0.915	0.638-1.17	1.44	1.13-1.95	2515	116-54460
Soybean	97-100	0.0602	>0.0602	N/A	>0.0602	N/A	>0.0602	N/A	N/A	N/A
Tomato	13-100	0.00676	0.0138	0.00821-0.0184	0.0232	0.0171-0.0286	0.0331	0.0267-0.0414	21275	663-682893

NC=Not calculable

Plant Injury Index											
Control	Corn	Onion	Ryegrass	Wheat	Cabbage	Carrot	Lettuce	Oilseed rape	Soybean	Tomato	Adjuvant control
0-2	0-18	2-92	0	0-36	2-88	2-100	0-90	0-96	6-76	8-100	0-4

0- No effect; 10-30- Slight effect; 40-60- Moderate effect; 70-90- Severe effect; 100- Complete effect

Monocot

EC₅₀/IC₅₀: 1.12 lbs ae/A 95% C.I.: 0.690-1.80 lbs ae/A
 EC₂₅/IC₂₅: 0.472 lbs ae/A 95% C.I.: 0.200-1.11 lbs ae/A
 EC₀₅/IC₀₅: 0.137 lbs ae/A 95% C.I.: 0.02896--0.6441 lbs ae/A
 NOAEC: 0.515 lbs ae/A
 Slope: 1.80 95% C.I.: 1.13-4.50
 Most sensitive monocot: Onion
 Most sensitive parameter: Dry weight

Dicot

EC₅₀/IC₅₀: 0.00670 lbs ae/A 95% C.I.: 0.00411-0.0109 lbs ae/A
 EC₂₅/IC₂₅: 0.000513 lbs ae/A 95% C.I.: Not calculable
 EC₀₅/IC₀₅: EC₀₅/IC₀₅: 0.000013 lbs ae/A 95% C.I.: 0.000003-- 0.000053
 NOAEC: <0.000261 lbs ae/A
 Slope: 0.605 95% C.I.: 0.514-0.735
 Most sensitive dicot: Soybean
 Most sensitive parameter: Height

D. STUDY DEFICIENCIES:

Definitive NOAECs could not be determined in this study for some endpoints, but EC₀₅s were calculated and will be used in risk assessment.

Lettuce growth in the negative control was -9% between day 14 and day 21 measurements. Lettuce growth in the surfactant and adjuvant with water only treatment was also -6%. Plants in controls should exhibit growth throughout the duration of the study. This is a major deviation from the guideline. Endpoints for lettuce from this study should not be used in risk assessment.

E. REVIEWER'S COMMENTS:

The study authors' and the reviewers' results were in agreement with regard to both the most sensitive monocot and dicot species. However, the toxicity values obtained were different. The study authors' NOAEC and EC₂₅ values for onion, based on dry weight, were 0.26 and 0.41 lbs ae/A, respectively. The reviewer's NOAEC and EC₂₅ values were 0.515 and 0.472, which were both higher (less conservative) than the study authors' reported values. Since the NOAEC was above the EC₂₅ value, the EC₀₅ value of 0.137 should be used in risk assessment for endangered species in place of the NOAEC. The study authors' NOAEC and EC₂₅ values for soybean, based on height, were 0.00026 and 0.00062 lbs ae/A, respectively. The reviewer's NOAEC and EC₂₅ values were <0.000261 and 0.000513, which were both lower (more conservative) than the study authors' reported values. Since a NOAEC could not be determined for soybean, the EC₀₅ value of 0.000013 lbs ae/A should be used in risk assessment for endangered species in place of the NOAEC. The reviewer used measured application rates and obtained 95% confidence intervals, whereas the study authors used nominal rates and did not report the confidence intervals. Therefore, the reviewer's results are presented in the Executive Summary and Conclusions sections of this DER.

Corn, onion, ryegrass, and wheat were tested at measured application rates of 0.0178 (<LOQ, controls), 0.125, 0.260, 0.515, 1.02, and 2.02 lbs ae/A. Soybean and tomato were tested at measured rates of 0.0178 (<LOQ, controls), 0.000261, 0.000751, 0.00227, 0.00676, 0.0196, and 0.0602 lbs ae/A. Cabbage and carrot were tested at measured rates of 0.0178 (<LOQ, controls), 0.00816, 0.0241, 0.0703, 0.215, 0.647, and 2.07 lbs ae/A. Lettuce was tested at measured rates of 0.0183 (<LOQ, controls), 0.000262, 0.000766, 0.00225, 0.00697, 0.0210, and 0.0646 lbs ae/A. Oilseed rape was tested at measured rates of 0.0183 (<LOQ, controls), 0.00851, 0.0254, 0.0739, 0.222, 0.661, and 2.08 lbs ae/A.

The study author only reported toxicity values in lbs ae/A for the most sensitive endpoints for each species; therefore, the reviewer had to convert the nominal concentrations reported by the study author in fl. oz form/A to lbs ae/A in order to report the study authors' findings in the Reported Effects tables.

The reviewer visually compared the negative control and surfactant plus adjuvant with water only treatment data for each species and endpoint to determine if there were differences. Ryegrass weight and tomato length were the only cases where the negative control and adjuvant only treatments were notably different, and there was a 17% promotion in weight in the adjuvant treatment as compared to the negative control for ryegrass and an 11% inhibition in height in the adjuvant treatment as compared to the negative control for tomato. T-tests showed that ryegrass weight was not significantly different between the negative control and adjuvant only treatment, and that tomato length was significantly different between the negative control and adjuvant only treatment. This contradictory effect was isolated to these two species and endpoint combinations, leading the reviewer to conclude that there were no impact of the adjuvant on the effects of the test material in this study.

Replicate C in the lettuce 0.67 fl. oz form/A treatment group, and replicate B in the soybean 0.025 fl. oz form/A treatment group were dropped from the study authors' analysis due to a lack of water until day 7 after test initiation. The reviewer also dropped these replicates from analysis.

The in-life portion of the test with corn, onion, ryegrass, and wheat was conducted from February 12 to March 5, 2009. The test with cabbage, carrot, soybean, and tomato was conducted from April 30 to May 21, 2009. The test with lettuce and oilseed rape was conducted from May 14 to June 4, 2009.

An initial test with tomato, lettuce, soybean, and cabbage was conducted from March 18 to April 8, 2009, and with carrot and oilseed rape from February 12 to March 5; however, the tests were repeated with different rates to obtain a clear dose-response relationship.

F. CONCLUSIONS:

The study is supplementary due to decreased growth of lettuce on day 21 relative to day 14 measurements. Continuation studies on lettuce are recommended. Endpoints for species other than lettuce may be quantitatively used in risk assessment. The most sensitive monocot species was onion, based on dry weight, with EC_{05} and EC_{25} values of 0.137 lbs ae/A and 0.472 lbs ae/A, respectively. The most sensitive dicot species was soybean, based on height, with EC_{05} and EC_{25} values of 0.000013 lbs ae/A and 0.000513 lbs ae/A, respectively.

Most sensitive monocot and EC_{25} : Onion (dry weight; 0.472 lbs ae/A)

Most sensitive dicot and EC_{25} : Soybean (height; 0.000513 lbs ae/A)

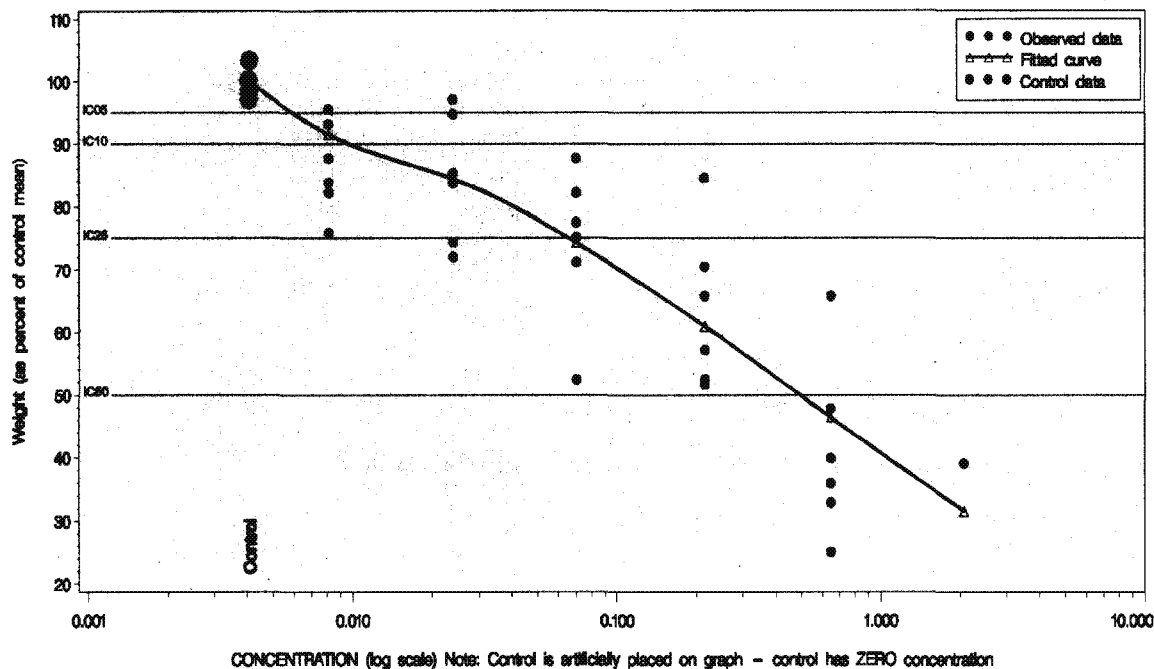
III. REFERENCES:

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2. U.S. Environmental Protection Agency. 1996. Series 850 – Ecological Effects Test Guidelines (*draft*), OPPTS Number 850.4250: Vegetative Vigor, Tier II.
3. Frans, Robert E. and Ronald E. Talbert. 1977. Design of Field Experiments and the Measurement and Analysis of Plant Responses. Pages 15-23 in B. Truelove, ed. *Research Methods in Weed Science*. Southern Weed Science Society, Auburn University, Alabama.
4. Bruce, Robert D. and Donald J. Versteeg. 1992. A Statistical Procedure for Modeling Continuous Toxicity Data. *Environmental Toxicology and Chemistry*. 11: 1485-1494.
5. SAS Institute, Inc. 1999. SAS Proprietary Software Version 8, Cary, NC, SAS Institute, Inc.

APPENDIX I. OUTPUT OF REVIEWER'S STATISTICAL VERIFICATION:

Weight Inhibition Concentrations (ICx) for Carrot

VEGETATIVE VIGOR (Dicamba) 029801 47815102 (SAS v9.2, Sprouts v1.0) 12JAN2010



Analysis results for Variable: WEIGHT Carrot

(SAS v9.2, Sprouts v1.0) VEGETATIVE VIGOR (Dicamba) 029801 47815102 12JAN2010

Comparing Control vs. Inactive Ingredient

Class	N	Mean	LowerCL	UpperCL	StdDev	StdErr	Minimum	Maximum
Control	6	1.2767	1.2387	1.3146	0.0361	0.0148	1.2400	1.3200
Inactive	6	1.1633	0.9567	1.3700	0.1969	0.0804	0.8700	1.4800
Diff (1-2)	—	0.1133	-0.0688	0.2955	0.1416	0.0817	—	—

TESTS OF ASSUMPTIONS FOR PARAMETRIC ANALYSIS

Shapiro-Wilks test for Normality of Residuals --- alpha-level=.01

Levenes test for homogeneity of variance (absolute residuals) -- alpha-level=.05

Use parametric analysis if neither test rejected, otherwise non-parametric analyses.

Shapiro-Wilks Test Stat	Shapiro-Wilks P-value	Levenes Test Stat	Levenes P-value	Conclusion
0.985	0.885	1.429	0.236	USE PARAMETRIC TESTS

BASIC SUMMARY STATISTICS

Level	N	Mean	StdDev	StdErr	CV(%)	95% Confidence Interval	
-1.000000	6	1.276667	0.036148	0.014757	2.83	1.238732,	1.314602
0.008160	6	1.103333	0.092880	0.037918	8.42	1.005862,	1.200805
0.024100	6	1.080000	0.130537	0.053292	12.09	0.943009,	1.216991
0.070300	6	0.950000	0.155306	0.063403	16.35	0.787016,	1.112984
0.215000	6	0.813333	0.161452	0.065912	19.85	0.643900,	0.982767
0.647000	6	0.526667	0.181071	0.073922	34.38	0.336644,	0.716689
2.070000	1	0.500000	.	.	.	.	.

Level	Median	Min	Max	%of Ctrl(means)	%Reduction(means)
-1.000000	1.265000	1.240000	1.320000	.	.
0.008160	1.095000	0.970000	1.220000	86.42	13.58
0.024100	1.080000	0.920000	1.240000	84.60	15.40
0.070300	0.975000	0.670000	1.120000	74.41	25.59
0.215000	0.785000	0.660000	1.080000	63.71	36.29
0.647000	0.485000	0.320000	0.840000	41.25	58.75
2.070000	0.500000	0.500000	0.500000	39.16	60.84

Analysis results for Variable:WEIGHT Carrot

PARAMETRIC ANALYSES - use alpha-level=0.05 for all tests

Analysis of Variance (ANOVA) - overall F-test

Numerator df	Denominator df	F-stat	P-value
6	30	20.66	<.0001

Dunnett -testing if each trt mean is significantly less than control

Williams-tests neg. trend. Check plots! TEST ASSUMES A MONOTONICALLY DECREASING DOSE RESPONSE.

Level	Mean	%Reduc Ctrl (means)	Dunnett p-value	Level	Isotonic mean	Williams p-value
Ctrl	1.276667	.	.	Ctrl	.	.
0.008160	1.103333	13.58	0.076	0.008160	1.103333	0.017
0.024100	1.080000	15.40	0.041	0.024100	1.080000	0.010
0.070300	0.950000	25.59	<.001	0.070300	0.950000	<.001
0.215000	0.813333	36.29	<.001	0.215000	0.813333	<.001
0.647000	0.526667	58.75	<.001	0.647000	0.526667	<.001
2.070000	0.500000	60.84	<.001	2.070000	0.500000	<.001

RESULTS SUMMARY

NOAEC

LOAEC

Dunnetts Test

0.00816

0.0241

Williams Test

<lowest dose

0.00816

The minimum significant difference was not calculated due to unequal sample sizes.

PARAMETER ESTIMATES FROM NONLINEAR MODELING

NOTE: Convergence criterion met.

WARNING: Do NOT report values below if convergence failed or convergence problems were noted.

Note that convergence does not necessarily mean a good model fit and/or good estimates!

LOOK AT GRAPHS! DO ESTIMATES MAKE SENSE? ICx estimates that fall outside the range of concentrations tested (along with their slope and CIs) are not likely to be reliable.

	Estimate	LowerCL	UpperCL
IC50	0.4930063	0.2775874	0.8755990
IC25	0.0657270	0.0243156	0.1776651
IC10	0.0107172	0.0022474	0.0511073
IC05	0.0036202	0.0005292	0.0247640

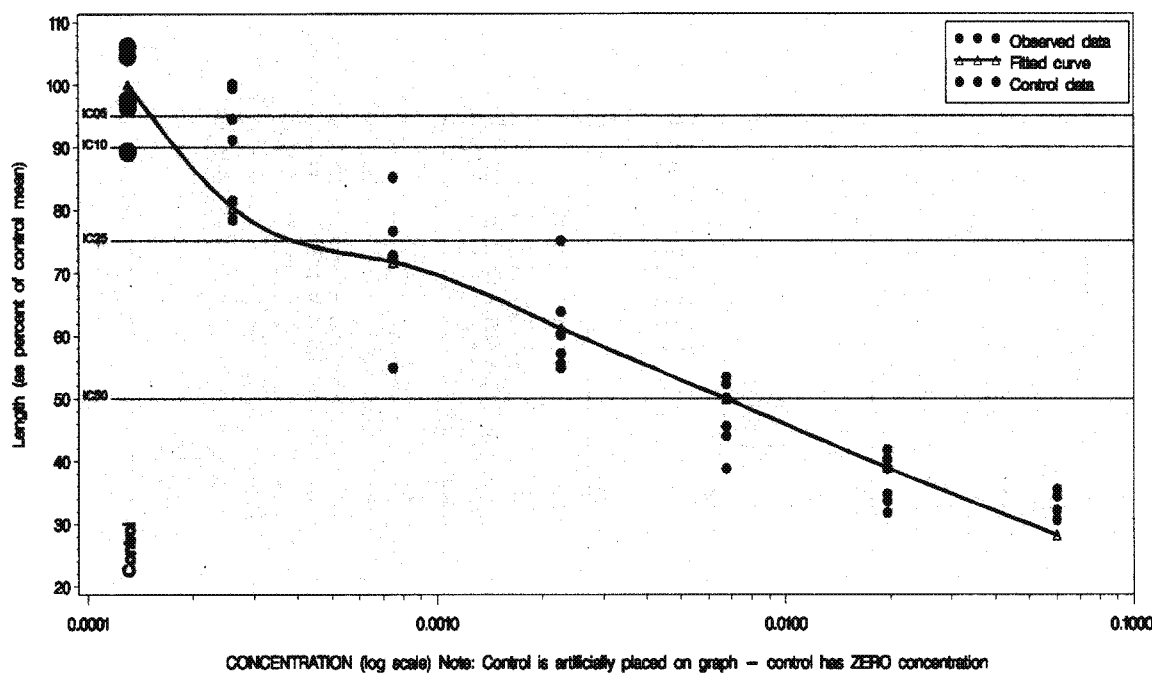
Slope	(LowerCL	UpperCL)
0.7708	0.5703	1.1886

OBSERVED vs PREDICTED TREATMENT GROUP MEANS

Level	N	Observed Mean	Predicted Mean	(Obs-Pred)	Pred % of Ctrl	Pred % Reduc from Ctrl
-1.000000	6	1.28	1.26	0.02	98.74	1.26
0.008160	6	1.10	1.15	-0.05	90.36	9.64
0.024100	6	1.08	1.06	0.02	83.32	16.68
0.070300	6	0.95	0.94	0.01	73.34	26.66
0.215000	6	0.81	0.77	0.05	60.17	39.83
0.647000	6	0.53	0.58	-0.06	45.79	54.21
2.070000	1	0.50	0.40	0.10	31.15	68.85

Length Inhibition Concentrations (ICx) for Soybean

VEGETATIVE VIGOR (Dicamba) 029801 47815102 (SAS v9.2, Sprouts v1.0) 12JAN2010



Analysis results for Variable: LENGTH Soybean

(SAS v9.2, Sprouts v1.0) VEGETATIVE VIGOR (Dicamba) 029801 47815102 12JAN2010

Comparing Control vs. Inactive Ingredient

Class	N	Mean	LowerCL	UpperCL	StdDev	StdErr	Minimum	Maximum
Control	6	53.5333	49.7259	57.3407	3.6280	1.4811	47.8000	56.8000
Inactive	6	51.1000	47.1249	55.0751	3.7879	1.5464	44.0000	54.4000
Diff (1-2)	—	2.4333	-2.3378	7.2044	3.7088	2.1413	—	—

TESTS OF ASSUMPTIONS FOR PARAMETRIC ANALYSIS

Shapiro-Wilks test for Normality of Residuals --- alpha-level=.01

Levenes test for homogeneity of variance (absolute residuals) -- alpha-level=.05

Use parametric analysis if neither test rejected, otherwise non-parametric analyses.

Shapiro-Wilks Test Stat	Shapiro-Wilks P-value	Levenes Test Stat	Levenes P-value	Conclusion
0.986	0.880	1.412	0.239	USE PARAMETRIC TESTS

BASIC SUMMARY STATISTICS

Level	N	Mean	StdDev	StdErr	CV(%)	95% Confidence Interval	
-1.000000	6	53.533333	3.628039	1.481141	6.78	49.725940,	57.340727
0.000261	6	48.633333	4.873466	1.989584	10.02	43.518945,	53.747722
0.000751	5	38.760000	5.904913	2.640757	15.23	31.428082,	46.091918
0.002270	6	32.733333	4.060870	1.657843	12.41	28.471711,	36.994955
0.006760	6	25.366667	2.978366	1.215913	11.74	22.241063,	28.492271
0.019600	6	19.733333	2.167641	0.884936	10.98	17.458534,	22.008133
0.060200	6	17.633333	1.120119	0.457287	6.35	16.457840,	18.808826

Level	Median	Min	Max	% of Ctrl (means)	% Reduction (means)
-1.000000	54.100000	47.800000	56.800000	.	.
0.000261	49.700000	42.000000	53.600000	90.85	9.15
0.000751	39.000000	29.400000	45.600000	72.40	27.60
0.002270	31.400000	29.400000	40.200000	61.15	38.85
0.006760	25.600000	20.800000	28.600000	47.38	52.62
0.019600	19.700000	17.000000	22.400000	36.86	63.14
0.060200	17.800000	16.400000	19.000000	32.94	67.06

Analysis results for Variable:LENGTH Soybean
--

PARAMETRIC ANALYSES - use alpha-level=0.05 for all tests

Analysis of Variance (ANOVA) - overall F-test

Numerator df	Denominator df	F-stat	P-value
6	34	82.15	<.0001

Dunnett -testing if each trt mean is significantly less than control

Williams-tests neg. trend. Check plots! TEST ASSUMES A MONOTONICALLY DECREASING DOSE RESPONSE.

Level	Mean	%Reduc Ctrl (means)	Dunnett p-value	Level	Isotonic mean	Williams p-value
Ctrl	53.533333	.	.	Ctrl	.	.
0.000261	48.633333	9.15	0.066	0.000261	48.633333	0.015
0.000751	38.760000	27.60	<.001	0.000751	38.760000	<.001
0.002270	32.733333	38.85	<.001	0.002270	32.733333	<.001
0.006760	25.366667	52.62	<.001	0.006760	25.366667	<.001
0.019600	19.733333	63.14	<.001	0.019600	19.733333	<.001
0.060200	17.633333	67.06	<.001	0.060200	17.633333	<.001

RESULTS SUMMARY

NOAEC

LOAEC

Dunnetts Test

0.000261

0.000751

Williams Test

<lowest dose

0.000261

The minimum significant difference was not calculated due to unequal sample sizes.

PARAMETER ESTIMATES FROM NONLINEAR MODELING

NOTE: Convergence criterion met.

WARNING: Do NOT report values below if convergence failed or convergence problems were noted.

Note that convergence does not necessarily mean a good model fit and/or good estimates!

LOOK AT GRAPHS! DO ESTIMATES MAKE SENSE? ICx estimates that fall outside the range of concentrations tested (along with their slope and CIs) are not likely to be reliable.

	Estimate	LowerCL	UpperCL
IC50	0.0066922	0.0041140	0.0108861
IC25	0.0005132	0.0002247	0.0011722
IC10	0.0000509	0.0000153	0.0001687
IC05	0.0000128	0.0000030	0.0000534

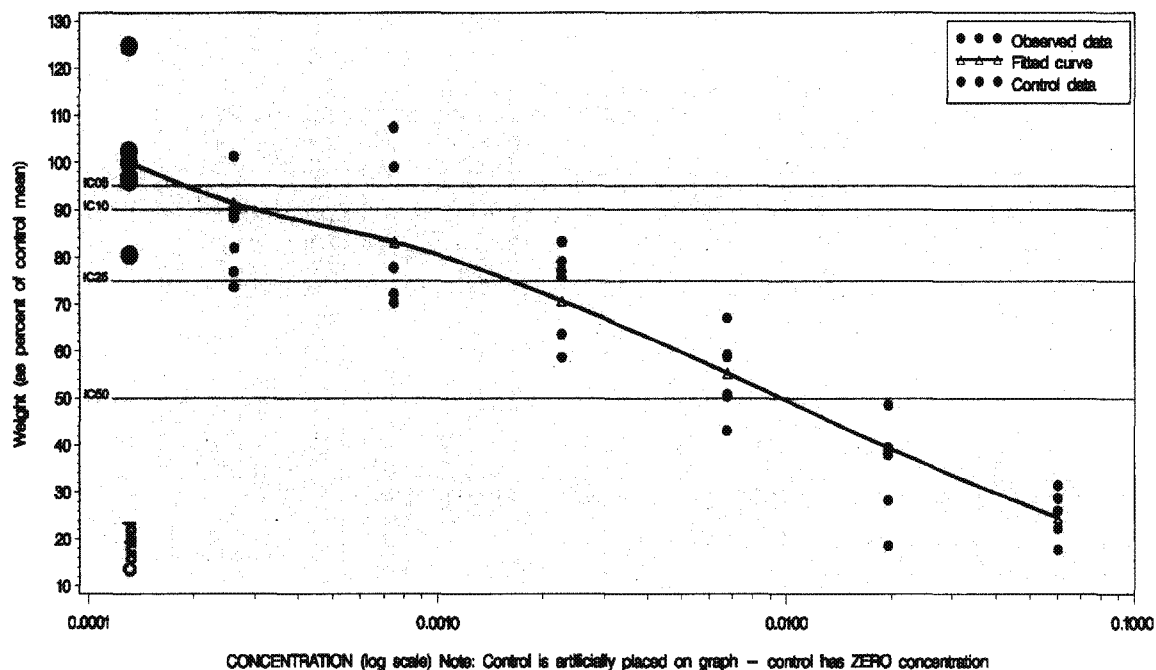
Slope	(LowerCl	UpperCl)
0.6048	0.5138	0.7350

OBSERVED vs PREDICTED TREATMENT GROUP MEANS

Level	N	Observed Mean	Predicted Mean	(Obs-Pred)	Pred % of Ctrl	Pred % Reduc from Ctrl
-1.000000	6	53.53	54.98	-1.45	102.70	-2.70
0.000261	6	48.63	44.14	4.49	82.46	17.54
0.000751	5	38.76	39.43	-0.67	73.66	26.34
0.002270	6	32.73	33.64	-0.90	62.83	37.17
0.006760	6	25.37	27.43	-2.07	51.24	48.76
0.019600	6	19.73	21.38	-1.65	39.94	60.06
0.060200	6	17.63	15.50	2.13	28.96	71.04

Weight Inhibition Concentrations (ICx) for Soybean

VEGETATIVE VIGOR (Dicamba) 029801 47815102 (SAS v9.2, Sprouts v1.0) 12JAN2010



Analysis results for Variable: WEIGHT Soybean

(SAS v9.2, Sprouts v1.0) VEGETATIVE VIGOR (Dicamba) 029801 47815102 12JAN2010

Comparing Control vs. Inactive Ingredient

Class	N	Mean	LowerCL	UpperCL	StdDev	StdErr	Minimum	Maximum
Control	6	7.2133	6.1306	8.2961	1.0317	0.4212	5.8000	8.9900
Inactive	6	6.7517	5.9343	7.5691	0.7789	0.3180	5.7600	7.6300
Diff (1-2)	—	0.4617	-0.7142	1.6376	0.9141	0.5278	—	—

TESTS OF ASSUMPTIONS FOR PARAMETRIC ANALYSIS

Shapiro-Wilks test for Normality of Residuals --- alpha-level=.01

Levenes test for homogeneity of variance (absolute residuals) -- alpha-level=.05

Use parametric analysis if neither test rejected, otherwise non-parametric analyses.

Shapiro-Wilks Test Stat	Shapiro-Wilks P-value	Levenes Test Stat	Levenes P-value	Conclusion
0.975	0.502	1.545	0.193	USE PARAMETRIC TESTS

BASIC SUMMARY STATISTICS

Level	N	Mean	StdDev	StdErr	CV(%)	95% Confidence Interval	
-1.000000	6	7.213333	1.031730	0.421202	14.30	6.130599,	8.296068
0.000261	6	6.145000	0.717266	0.292822	11.67	5.392276,	6.897724
0.000751	5	6.154000	1.214549	0.543163	19.74	4.645938,	7.662062
0.002270	6	5.260000	0.691549	0.282324	13.15	4.534264,	5.985736
0.006760	6	3.958333	0.611602	0.249685	15.45	3.316497,	4.600170
0.019600	6	2.536667	0.747226	0.305054	29.46	1.752501,	3.320832
0.060200	6	1.863333	0.362087	0.147821	19.43	1.483347,	2.243320

Level	Median	Min	Max	%of Ctrl(means)	%Reduction(means)
-1.000000	7.095000	5.800000	8.990000	.	.
0.000261	6.140000	5.310000	7.300000	85.19	14.81
0.000751	5.610000	5.070000	7.750000	85.31	14.69
0.002270	5.520000	4.230000	6.000000	72.92	27.08
0.006760	3.950000	3.110000	4.840000	54.88	45.12
0.019600	2.745000	1.340000	3.500000	35.17	64.83
0.060200	1.975000	1.280000	2.270000	25.83	74.17

Analysis results for Variable:WEIGHT Soybean
--

PARAMETRIC ANALYSES - use alpha-level=0.05 for all tests

Analysis of Variance (ANOVA) - overall F-test

Numerator df	Denominator df	F-stat	P-value
6	34	37.56	<.0001

Dunnett -testing if each trt mean is significantly less than control

Williams-tests neg. trend. Check plots! TEST ASSUMES A MONOTONICALLY DECREASING DOSE RESPONSE.

Level	Mean	%Reduc Ctrl (means)	Dunnett p-value	Level	Isotonic mean	Williams p-value
Ctrl	7.213333	.	.	Ctrl	.	.
0.000261	6.145000	14.81	0.057	0.000261	6.149091	0.013
0.000751	6.154000	14.69	0.074	0.000751	6.149091	0.019
0.002270	5.260000	27.08	<.001	0.002270	5.260000	<.001
0.006760	3.958333	45.12	<.001	0.006760	3.958333	<.001
0.019600	2.536667	64.83	<.001	0.019600	2.536667	<.001
0.060200	1.863333	74.17	<.001	0.060200	1.863333	<.001

RESULTS SUMMARY

NOAEC

LOAEC

Dunnetts Test

0.000751

0.00227

Williams Test

<lowest dose

0.000261

The minimum significant difference was not calculated due to unequal sample sizes.

PARAMETER ESTIMATES FROM NONLINEAR MODELING

NOTE: Convergence criterion met.

WARNING: Do NOT report values below if convergence failed or convergence problems were noted.

Note that convergence does not necessarily mean a good model fit and/or good estimates!

LOOK AT GRAPHS! DO ESTIMATES MAKE SENSE? ICx estimates that fall outside the range of concentrations tested (along with their slope and CIs) are not likely to be reliable.

	Estimate	LowerCL	UpperCL
IC50	0.0096042	0.0058922	0.0156546
IC25	0.0015979	0.0007017	0.0036390
IC10	0.0003180	0.0000982	0.0010300
IC05	0.0001210	0.0000300	0.0004877

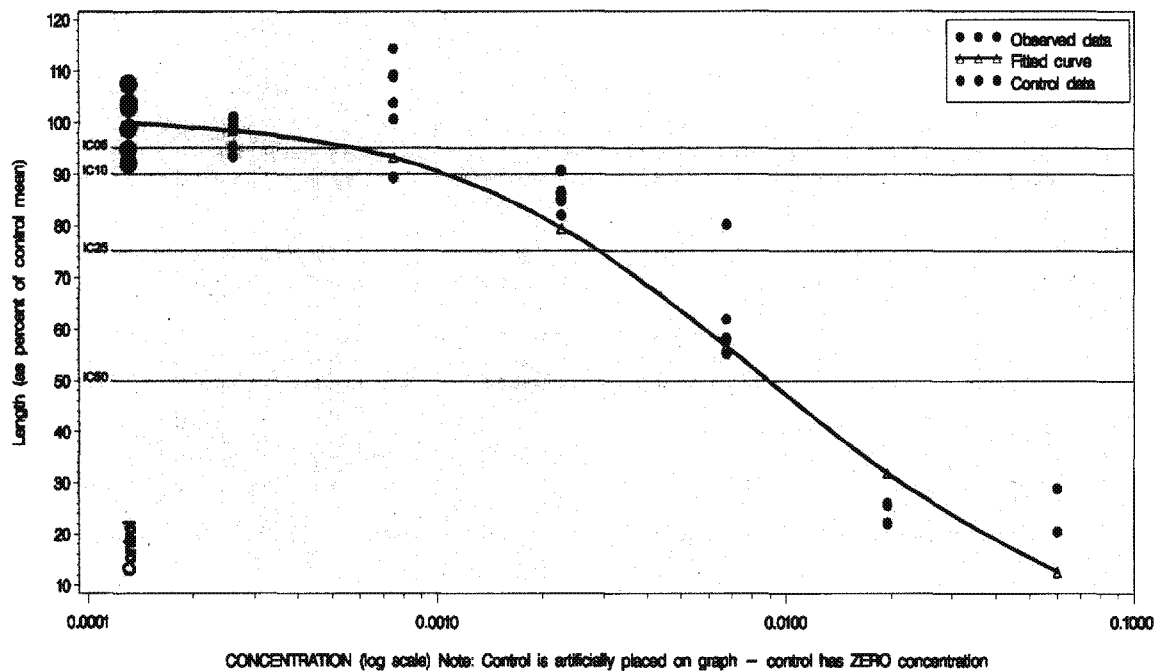
Slope	(LowerCl	UpperCl)
0.8660	0.7001	1.1348

OBSERVED vs PREDICTED TREATMENT GROUP MEANS

Level	N	Observed Mean	Predicted Mean	(Obs-Pred)	Pred % of Ctrl	Pred % Reduc from Ctrl
-1.000000	6	7.21	7.13	0.08	98.84	1.16
0.000261	6	6.15	6.51	-0.36	90.18	9.82
0.000751	5	6.15	5.93	0.23	82.14	17.86
0.002270	6	5.26	5.04	0.22	69.81	30.19
0.006760	6	3.96	3.94	0.02	54.61	45.39
0.019600	6	2.54	2.81	-0.27	38.97	61.03
0.060200	6	1.86	1.75	0.12	24.22	75.78

Length Inhibition Concentrations (ICx) for Tomato

VEGETATIVE VIGOR (Dicamba) 029801 47815102 (SAS v9.2, Sprouts v1.0) 12JAN2010



Analysis results for Variable: LENGTH Tomato

(SAS v9.2, Sprouts v1.0) VEGETATIVE VIGOR (Dicamba) 029801 47815102 12JAN2010

Comparing Control vs. Inactive Ingredient

Class	N	Mean	LowerCL	UpperCL	StdDev	StdErr	Minimum	Maximum
Control	6	43.9000	41.1934	46.6066	2.5791	1.0529	40.4000	47.2000
Inactive	6	39.2667	33.1985	45.3348	5.7823	2.3606	33.6000	50.0000
Diff (1-2)	—	4.6333	-1.1259	10.3926	4.4770	2.5848	—	—

TESTS OF ASSUMPTIONS FOR PARAMETRIC ANALYSIS

Shapiro-Wilks test for Normality of Residuals --- alpha-level=.01

Levenes test for homogeneity of variance (absolute residuals) - alpha-level=.05

Use parametric analysis if neither test rejected, otherwise non-parametric analyses.

Shapiro-Wilks Test Stat	Shapiro-Wilks P-value	Levenes Test Stat	Levenes P-value	Conclusion
0.943	0.053	1.842	0.123	USE PARAMETRIC TESTS

BASIC SUMMARY STATISTICS

Level	N	Mean	StdDev	StdErr	CV(%)	95% Confidence Interval	
-1.000000	6	43.900000	2.579147	1.052932	5.88	41.193351,	46.606649
0.000261	6	43.066667	1.354499	0.552972	3.15	41.645207,	44.488126
0.000751	6	45.833333	3.856250	1.574308	8.41	41.786447,	49.880220
0.002270	6	37.700000	1.244186	0.507937	3.30	36.394306,	39.005694
0.006760	6	26.966667	4.182663	1.707565	15.51	22.577231,	31.356102
0.019600	6	10.502778	0.858126	0.350328	8.17	9.602230,	11.403325
0.060200	2	10.833333	2.592725	1.833333	23.93	0.000000,	34.128042

Level	Median	Min	Max	%of Ctrl(means)	%Reduction(means)
-1.000000	44.300000	40.400000	47.200000	.	.
0.000261	43.600000	41.000000	44.400000	98.10	1.90
0.000751	46.700000	39.200000	50.200000	104.4	-4.40
0.002270	37.600000	36.000000	39.800000	85.88	14.12
0.006760	25.500000	24.200000	35.200000	61.43	38.57
0.019600	10.475000	9.666667	11.400000	23.92	76.08
0.060200	10.833333	9.000000	12.666667	24.68	75.32

Analysis results for Variable:LENGTH Tomato

PARAMETRIC ANALYSES - use alpha-level=0.05 for all tests

Analysis of Variance (ANOVA) - overall F-test

Numerator df	Denominator df	F-stat	P-value
6	31	155.02	<.0001

Dunnett -testing if each trt mean is significantly less than control

Williams-tests neg. trend. Check plots! TEST ASSUMES A MONOTONICALLY DECREASING DOSE RESPONSE.

Level	Mean	%Reduc Ctrl (means)	Dunnett p-value	Level	Isotonic mean	Williams p-value
Ctrl	43.900000	.	.	Ctrl	.	.
0.000261	43.066667	1.90	0.685	0.000261	44.266667	0.593
0.000751	45.833333	-4.40	0.996	0.000751	44.266667	0.681
0.002270	37.700000	14.12	<.001	0.002270	37.700000	<.001
0.006760	26.966667	38.57	<.001	0.006760	26.966667	<.001
0.019600	10.502778	76.08	<.001	0.019600	10.585417	<.001
0.060200	10.833333	75.32	<.001	0.060200	10.585417	<.001

RESULTS SUMMARY

	NOAEC	LOAEC
Dunnetts Test	0.000751	0.00227
Williams Test	0.000751	0.00227

The minimum significant difference was not calculated due to unequal sample sizes.

PARAMETER ESTIMATES FROM NONLINEAR MODELING

NOTE: Convergence criterion met.

WARNING: Do NOT report values below if convergence failed or convergence problems were noted.

Note that convergence does not necessarily mean a good model fit and/or good estimates!

LOOK AT GRAPHS! DO ESTIMATES MAKE SENSE? ICx estimates that fall outside the range of concentrations tested (along with their slope and CIs) are not likely to be reliable.

	Estimate	LowerCL	UpperCL
IC50	0.0089072	0.0066560	0.0119198
IC25	0.0028993	0.0017899	0.0046965
IC10	0.0010558	0.0005305	0.0021012
IC05	0.0005768	0.0002549	0.0013052

Slope	(LowerCL	UpperCL)
1.3837	1.1306	1.7831

OBSERVED vs PREDICTED TREATMENT GROUP MEANS

Level	N	Observed Mean	Predicted Mean	(Obs-Pred)	Pred % of Ctrl	Pred % Reduc from Ctrl
-1.000000	6	43.90	45.66	-1.76	104.00	-4.00
0.000261	6	43.07	44.88	-1.82	102.24	-2.24
0.000751	6	45.83	42.52	3.31	96.87	3.13
0.002270	6	37.70	36.27	1.43	82.61	17.39
0.006760	6	26.97	25.83	1.13	58.85	41.15
0.019600	6	10.50	14.51	-4.01	33.05	66.95
0.060200	2	10.83	5.73	5.11	13.04	86.96

File: DGA_VV_Tomato_Length

Transform: NO TRANSFORM

t-test of Solvent and Blank Controls

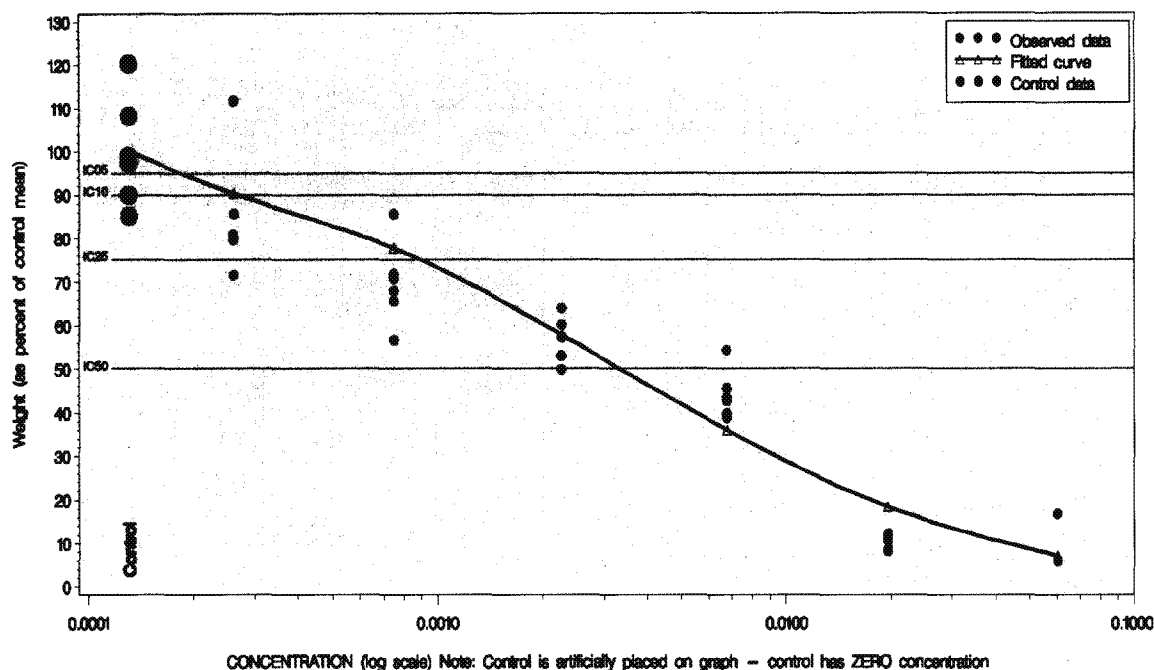
Ho:GRP1 MEAN = GRP2 MEAN

GRP1 (SOLVENT CRTL) MEAN =	43.9000	CALCULATED t VALUE =	3.0801
GRP2 (BLANK CRTL) MEAN =	39.2667	DEGREES OF FREEDOM =	58
DIFFERENCE IN MEANS =	4.6333		

TABLE t VALUE (0.05 (2),60) = 2.000** SIGNIFICANT DIFFERENCE at alpha=0.05
TABLE t VALUE (0.01 (2),60) = 2.660** SIGNIFICANT DIFFERENCE at alpha=0.01

Weight Inhibition Concentrations (ICx) for Tomato

VEGETATIVE VIGOR (Dicamba) 029801 47815102 (SAS v9.2, Sprouts v1.0) 12JAN2010



Analysis results for Variable: WEIGHT Tomato

(SAS v9.2, Sprouts v1.0) VEGETATIVE VIGOR (Dicamba) 029801 47815102 12JAN2010

Comparing Control vs. Inactive Ingredient

Class	N	Mean	LowerCL	UpperCL	StdDev	StdErr	Minimum	Maximum
Control	6	7.2600	6.2877	8.2323	0.9265	0.3783	6.1800	8.7400
Inactive	6	6.6117	5.6549	7.5684	0.9117	0.3722	5.5500	8.2400
Diff (1-2)	—	0.6483	-0.5341	1.8307	0.9191	0.5307	—	—

TESTS OF ASSUMPTIONS FOR PARAMETRIC ANALYSIS

Shapiro-Wilks test for Normality of Residuals --- alpha-level=.01

Levenes test for homogeneity of variance (absolute residuals) -- alpha-level=.05

Use parametric analysis if neither test rejected, otherwise non-parametric analyses.

Shapiro-Wilks	Shapiro-Wilks	Levenes	Levenes	Conclusion
Test Stat	P-value	Test Stat	P-value	
0.904	0.003	1.626	0.173	USE NON-PARAMETRIC TESTS

BASIC SUMMARY STATISTICS

Level	N	Mean	StdDev	StdErr	CV(%)	95% Confidence Interval	
-1.000000	6	7.260000	0.926520	0.378250	12.76	6.287677,	8.232323
0.000261	6	6.161667	1.009265	0.412031	16.38	5.102508,	7.220826
0.000751	6	5.060000	0.687139	0.280523	13.58	4.338892,	5.781108
0.002270	6	4.135000	0.362919	0.148161	8.78	3.754140,	4.515860
0.006760	6	3.203333	0.402923	0.164492	12.58	2.780492,	3.626175
0.019600	6	0.743333	0.114310	0.046667	15.38	0.623373,	0.863294
0.060200	2	0.825000	0.558614	0.395000	67.71	0.000000,	5.843951

Level	Median	Min	Max	%of Ctrl(means)	%Reduction(means)
-1.000000	7.125000	6.180000	8.740000	.	.
0.000261	5.830000	5.200000	8.110000	84.87	15.13
0.000751	5.035000	4.110000	6.210000	69.70	30.30
0.002270	4.165000	3.620000	4.640000	56.96	43.04
0.006760	3.130000	2.820000	3.940000	44.12	55.88
0.019600	0.775000	0.590000	0.880000	10.24	89.76
0.060200	0.825000	0.430000	1.220000	11.36	88.64

Analysis results for Variable: WEIGHT Tomato

NON-PARAMETRIC ANALYSES - use alpha-level=.05 for all tests

Kruskal-Wallis test - testing if at least one group differs signif. from others

Exact p-value Conclusion

<.0001 At least one group differs

Mann-Whitney-Wilcoxon (NO Bonf. adj) - test if each trt is signif. less than control

Jonckheere - Check plots! Test assumes a monotonically decreasing response. Testing neg. trend

Level	Median	%Reduc Ctrl (medians)	MannWW Exact p (NO Bonf)	Level	Median	Jonckheere p-value
Ctrl	7.125000	.	.	Ctrl	7.125000	.
0.000261	5.830000	18.18	0.032	0.000261	5.830000	0.027
0.000751	5.035000	29.33	0.002	0.000751	5.035000	<.001
0.002270	4.165000	41.54	0.001	0.002270	4.165000	<.001
0.006760	3.130000	56.07	0.001	0.006760	3.130000	<.001
0.019600	0.775000	89.12	0.001	0.019600	0.775000	<.001
0.060200	0.825000	88.42	0.036	0.060200	0.825000	<.001

RESULTS SUMMARY	NOAEC	LOAEC
Mann Whitney Test	<lowest dose	0.000261
Jonckheere-Terpstra Test	<lowest dose	0.000261

PARAMETER ESTIMATES FROM NONLINEAR MODELING

NOTE: Convergence criterion met.

WARNING: Do NOT report values below if convergence failed or convergence problems were noted.

Note that convergence does not necessarily mean a good model fit and/or good estimates!

LOOK AT GRAPHS! DO ESTIMATES MAKE SENSE? ICx estimates that fall outside the range of concentrations tested (along with their slope and CIs) are not likely to be reliable.

	Estimate	LowerCL	UpperCL
IC50	0.0033335	0.0021203	0.0052407
IC25	0.0008860	0.0004422	0.0017752
IC10	0.0002688	0.0001049	0.0006887
IC05	0.0001317	0.0000442	0.0003927

Slope	(LowerCl	UpperCl)
1.1721	0.9571	1.5118

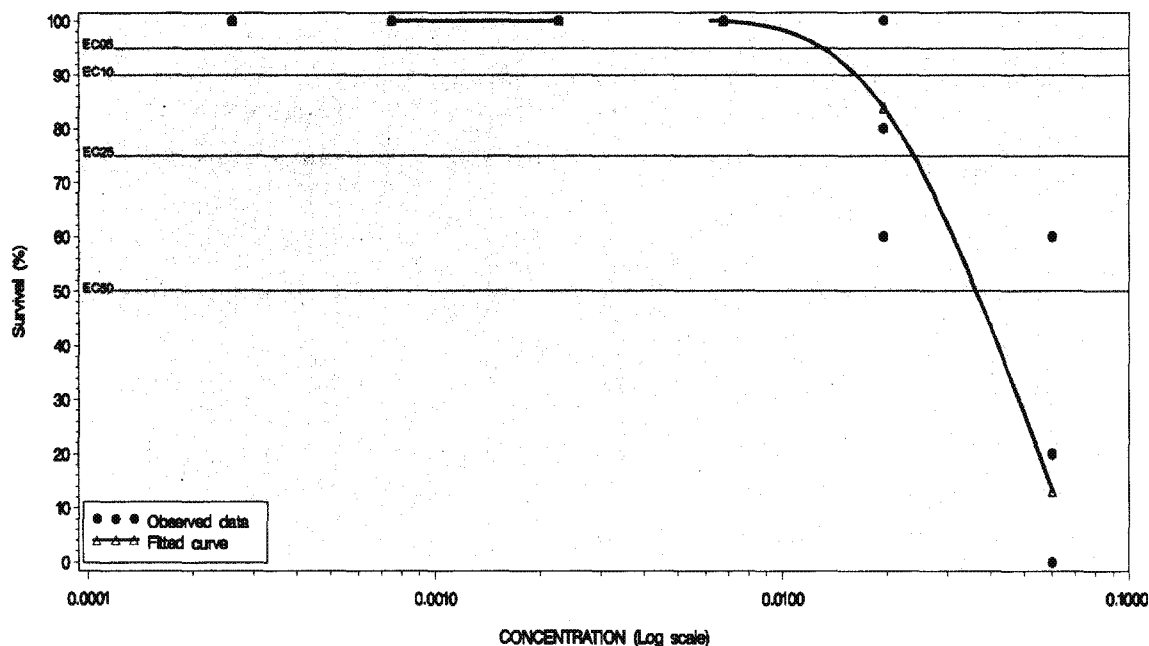
OBSERVED vs PREDICTED TREATMENT GROUP MEANS

Level	N	Observed Mean	Predicted Mean	(Obs-Pred)	Pred % of Ctrl	Pred % Reduc from Ctrl
-1.000000	6	7.26	7.02	0.24	96.71	3.29
0.000261	6	6.16	6.34	-0.18	87.29	12.71
0.000751	6	5.06	5.45	-0.39	75.04	24.96
0.002270	6	4.14	4.05	0.08	55.85	44.15
0.006760	6	3.20	2.52	0.68	34.76	65.24
0.019600	6	0.74	1.29	-0.55	17.75	82.25
0.060200	2	0.83	0.49	0.33	6.81	93.19

Survival (%) Effect Concentrations (ECx) for Tomato

VEGETATIVE VIGOR (Dicamba) 029801 47815102 (SAS v9.2, Sprouts v1.0) 12JAN2010

Fitted values adjusted against baseline control mortality



Analysis results for Variable: PERCENT_SURVIVE Tomato

(SAS v9.2, Sprouts v1.0) VEGETATIVE VIGOR (Dicamba) 029801 47815102 12JAN2010

Comparing Control vs. Inactive Ingredient

Class	N	Mean	LowerCL	UpperCL	StdDev	StdErr	Minimum	Maximum
Control	6	100.0	100.0	100.0	0	0	100.0	100.0
Inactive	6	100.0	100.0	100.0	0	0	100.0	100.0
Diff (1-2)	0	0	0	0	0	0	—	—

TESTS OF ASSUMPTIONS FOR PARAMETRIC ANALYSIS

Shapiro-Wilks test for Normality of Residuals --- alpha-level=.01

Levenes test for homogeneity of variance (absolute residuals) -- alpha-level=.05

Use parametric analysis if neither test rejected, otherwise non-parametric analyses.

Shapiro-Wilks Test Stat	Shapiro-Wilks P-value	Levenes Test Stat	Levenes P-value	Conclusion
0.613	<.001	7.841	<.001	USE NON-PARAMETRIC TESTS

BASIC SUMMARY STATISTICS

Level	N	Mean	StdDev	StdErr	CV(%)	95% Confidence Interval
-1.000000	6	100.0	0.00	0.00	0.00	. , .
0.000261	6	100.0	0.00	0.00	0.00	. , .
0.000751	6	100.0	0.00	0.00	0.00	. , .
0.002270	6	100.0	0.00	0.00	0.00	. , .
0.006760	6	100.0	0.00	0.00	0.00	. , .
0.019600	6	83.33	15.06	6.15	18.07	67.53 , 99.13
0.060200	6	13.33	24.22	9.89	181.7	0.00 , 38.75

Level	Median	Min	Max	%of Ctrl(means)	%Reduction(means)
-1.000000	100.0	100.0	100.0	.	.
0.000261	100.0	100.0	100.0	100.0	0.00
0.000751	100.0	100.0	100.0	100.0	0.00
0.002270	100.0	100.0	100.0	100.0	0.00
0.006760	100.0	100.0	100.0	100.0	0.00
0.019600	80.00	60.00	100.0	83.33	16.67
0.060200	0.00	0.00	60.00	13.33	86.67

Analysis results for Variable: PERCENT_SURVIVE Tomato

NON-PARAMETRIC ANALYSES - use alpha-level=.05 for all tests

Kruskal-Wallis test - testing if at least one group differs signif. from others

Exact p-value Conclusion

<.0001 At least one group differs

Mann-Whitney-Wilcoxon (NO Bonf. adj) - test if each trt is signif. less than control

Jonckheere - Check plots! Test assumes a monotonically decreasing response. Testing neg. trend

Level	Median	%Reduc Ctrl (medians)	MannWW Exact p (NO Bonf)	Level	Median	Jonckheere p-value
Ctrl	100.0	.	.	Ctrl	100.0	.
0.000261	100.0	0.00	1.000	0.000261	100.0	.
0.000751	100.0	0.00	1.000	0.000751	100.0	.
0.002270	100.0	0.00	1.000	0.002270	100.0	.
0.006760	100.0	0.00	1.000	0.006760	100.0	.
0.019600	80.00	20.00	0.030	0.019600	80.00	0.001
0.060200	0.00	100.0	0.001	0.060200	0.00	<.001

RESULTS SUMMARY

NOAEC

LOAEC

Mann Whitney Test

0.00676

0.0196

Jonckheere-Terpstra Test

0.00676

0.0196

PARAMETER ESTIMATES FROM PROBIT ANALYSIS

Note: Baseline mortality correction factor used in estimating ECx values

Note: Algorithm converged.

WARNING: Do NOT report values below if convergence failed or convergence problems were noted.

Note that convergence does not necessarily mean a good model fit and/or good estimates!

LOOK AT GRAPHS! DO ESTIMATES MAKE SENSE? ECx estimates that fall outside the range of concentrations tested (along with their slope and CIs) are not likely to be reliable.

	Estimate	LowerCL	UpperCL
EC50	0.0331451	0.0266890	0.0414002
EC25	0.0231511	0.0170893	0.0285720
EC10	0.0167611	0.0108740	0.0215308
EC05	0.0138152	0.0082050	0.0183795

Slope (LowerCl, UpperCl)

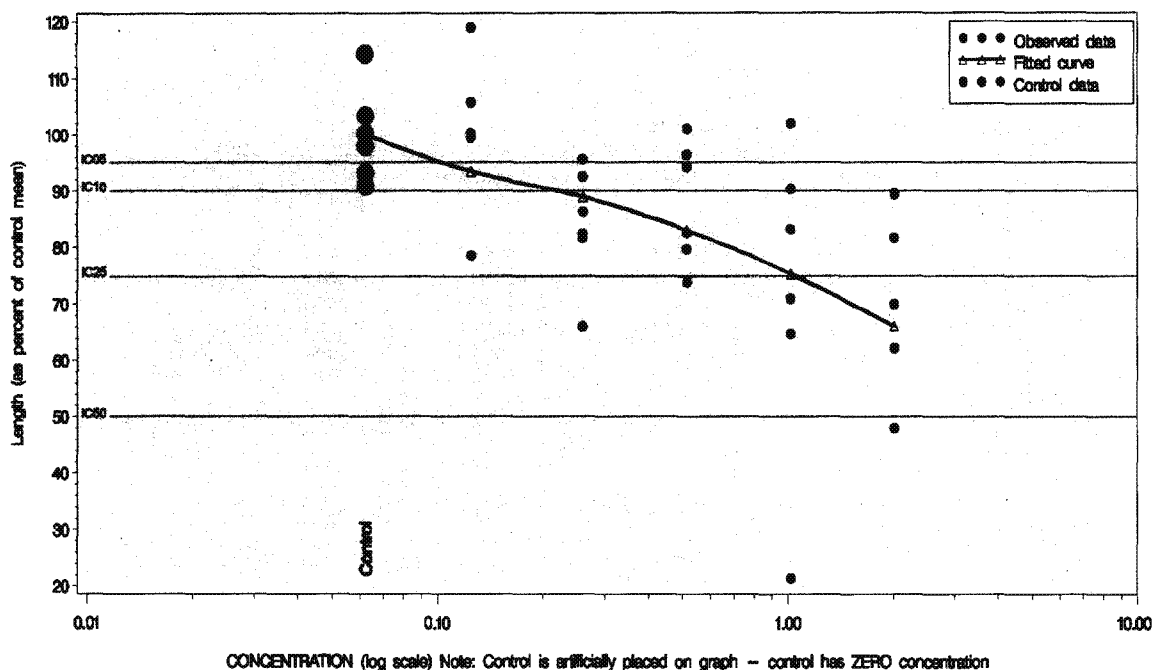
21274.9855 662.8049 682893.249

OBSERVED vs PREDICTED TREATMENT GROUP MEANS

Level	N	Observed Mean	Predicted Mean	(Obs-Pred)	Pred % of Ctrl	Pred % Reduc from Ctrl
-1.000000	.	100.00	.	.	.	.
0.000261	6	100.00	100.00	0.00	100.00	0.00
0.000751	6	100.00	100.00	0.00	100.00	0.00
0.002270	6	100.00	100.00	0.00	100.00	0.00
0.006760	6	100.00	99.86	0.14	99.86	0.14
0.019600	6	83.33	83.83	-0.50	83.83	16.17
0.060200	6	13.33	13.10	0.23	13.10	86.90

Length Inhibition Concentrations (ICx) for Onion

VEGETATIVE VIGOR (Dicamba) 029801 47815102 (SAS v9.2, Sprouts v1.0) 12JAN2010



Analysis results for Variable: LENGTH Onion

(SAS v9.2, Sprouts v1.0) VEGETATIVE VIGOR (Dicamba) 029801 47815102 12JAN2010

Comparing Control vs. Inactive Ingredient

Class	N	Mean	LowerCL	UpperCL	StdDev	StdErr	Minimum	Maximum
Control	6	25.7333	23.4858	27.9809	2.1417	0.8743	23.4000	29.4000
Inactive	6	25.1333	22.6019	27.6648	2.4122	0.9848	21.4000	28.4000
Diff (1-2)	—	0.6000	-2.3342	3.5342	2.2809	1.3169	—	—

TESTS OF ASSUMPTIONS FOR PARAMETRIC ANALYSIS

Shapiro-Wilks test for Normality of Residuals --- alpha-level=.01

Levenes test for homogeneity of variance (absolute residuals) -- alpha-level=.05

Use parametric analysis if neither test rejected, otherwise non-parametric analyses.

Shapiro-Wilks Test Stat	Shapiro-Wilks P-value	Levenes Test Stat	Levenes P-value	Conclusion
0.937	0.041	1.572	0.198	USE PARAMETRIC TESTS

BASIC SUMMARY STATISTICS

Level	N	Mean	StdDev	StdErr	CV(%)	95% Confidence Interval
-1.000000	6	25.733333	2.141650	0.874325	8.32	23.485809, 27.980858
0.125000	6	25.866667	3.357777	1.370807	12.98	22.342896, 29.390438
0.260000	6	21.633333	2.678557	1.093516	12.38	18.822360, 24.444306
0.515000	6	22.633333	2.767972	1.130020	12.23	19.728525, 25.538141
1.020000	6	18.552778	7.258676	2.963342	39.12	10.935264, 26.170291
2.020000	6	17.722222	3.837920	1.566824	21.66	13.694572, 21.749872

Level	Median	Min	Max	%of Ctrl(means)	%Reduction(means)
-1.000000	25.500000	23.400000	29.400000	.	.
0.125000	25.800000	20.200000	30.600000	100.5	-0.52
0.260000	21.700000	17.000000	24.600000	84.07	15.93
0.515000	22.750000	19.000000	26.000000	87.95	12.05
1.020000	19.825000	5.500000	26.250000	72.10	27.90
2.020000	17.000000	12.333333	23.000000	68.87	31.13

Analysis results for Variable:LENGTH Onion
--

PARAMETRIC ANALYSES - use alpha-level=0.05 for all tests

Analysis of Variance (ANOVA) - overall F-test

Numerator df	Denominator df	F-stat	P-value
5	30	4.37	0.0041

Dunnett -testing if each trt mean is significantly less than control

Williams-tests neg. trend. Check plots! TEST ASSUMES A MONOTONICALLY DECREASING DOSE RESPONSE.

Level	Mean	%Reduc Ctrl (means)	Dunnett p-value	Level	Isotonic mean	Williams p-value
Ctrl	25.733333	.	.	Ctrl	.	.
0.125000	25.866667	-0.52	0.850	0.125000	25.800000	0.511
0.260000	21.633333	15.93	0.148	0.260000	22.133333	0.079
0.515000	22.633333	12.05	0.282	0.515000	22.133333	0.083
1.020000	18.552778	27.90	0.009	1.020000	18.552778	0.003
2.020000	17.722222	31.13	0.004	2.020000	17.722222	<.001

RESULTS SUMMARY

NOAEC

LOAEC

Dunnetts Test

0.515

1.02

Williams Test

0.515

1.02

MSD=The minimum diff Dunnett's was able detect as being statistically significant at .05

MSD: 5.45 %Change from ctrl the MSD represents: 21.19

PARAMETER ESTIMATES FROM NONLINEAR MODELING

NOTE: Convergence criterion met.

WARNING: Do NOT report values below if convergence failed or convergence problems were noted.

Note that convergence does not necessarily mean a good model fit and/or good estimates!

LOOK AT GRAPHS! DO ESTIMATES MAKE SENSE? ICx estimates that fall outside the range of concentrations tested (along with their slope and CIs) are not likely to be reliable.

	Estimate	LowerCL	UpperCL
IC50	5.7834866	1.5429806	21.6779902
IC25	1.0400873	0.3559284	3.0393233
IC10	0.2220274	0.0265869	1.8541511
IC05	0.0881189	0.0049632	1.5644949

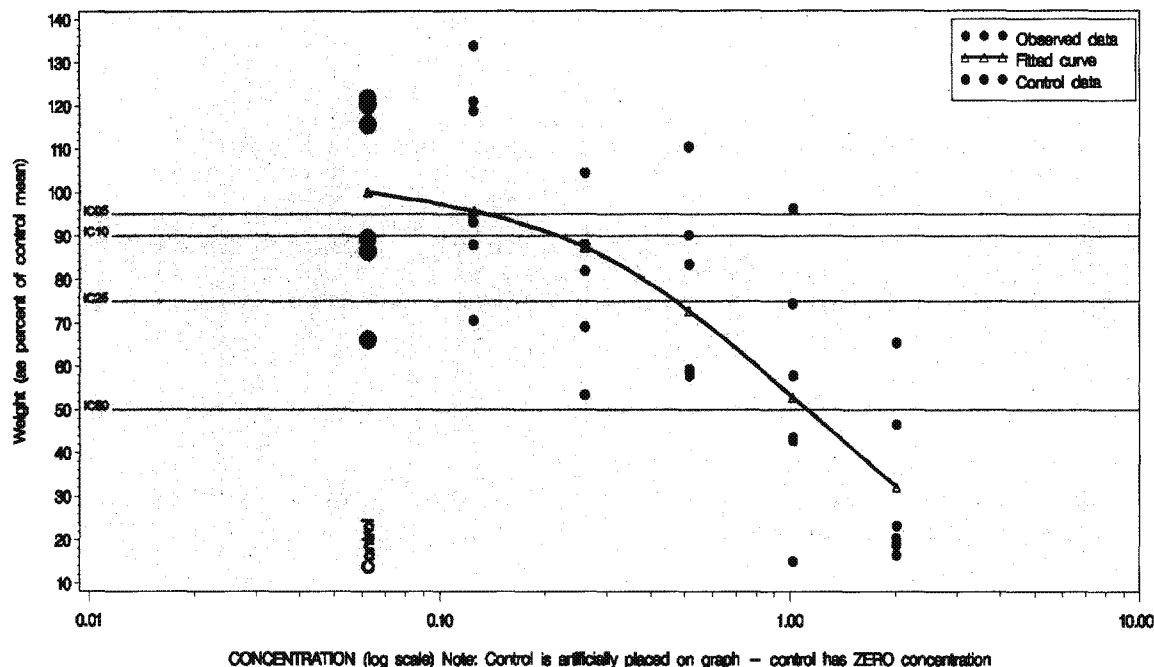
Slope	(LowerCl	UpperCl)
0.9052	0.4817	7.4905

OBSERVED vs PREDICTED TREATMENT GROUP MEANS

Level	N	Observed Mean	Predicted Mean	(Obs-Pred)	Pred % of Ctrl	Pred % Reduc from Ctrl
-1.000000	6	25.73	26.09	-0.36	101.39	-1.39
0.125000	6	25.87	24.37	1.49	94.71	5.29
0.260000	6	21.63	23.19	-1.55	90.10	9.90
0.515000	6	22.63	21.63	1.00	84.07	15.93
1.020000	6	18.55	19.63	-1.08	76.29	23.71
2.020000	6	17.72	17.23	0.49	66.96	33.04

Weight Inhibition Concentrations (ICx) for Onion

VEGETATIVE VIGOR (Dicamba) 029801 47815102 (SAS v9.2, Sprouts v1.0) 12JAN2010



Analysis results for Variable: WEIGHT Onion

(SAS v9.2, Sprouts v1.0) VEGETATIVE VIGOR (Dicamba) 029801 47815102 12JAN2010

Comparing Control vs. Inactive Ingredient

Class	N	Mean	LowerCL	UpperCL	StdDev	StdErr	Minimum	Maximum
Control	6	0.1330	0.1013	0.1647	0.0302	0.0123	0.0880	0.1620
Inactive	6	0.1473	0.1128	0.1819	0.0329	0.0134	0.1030	0.1830
Diff (1-2)	—	-0.0143	-0.0550	0.0263	0.0316	0.0182	—	—

TESTS OF ASSUMPTIONS FOR PARAMETRIC ANALYSIS

Shapiro-Wilks test for Normality of Residuals --- alpha-level=.01

Levenes test for homogeneity of variance (absolute residuals) -- alpha-level=.05

Use parametric analysis if neither test rejected, otherwise non-parametric analyses.

Shapiro-Wilks Test Stat	Shapiro-Wilks P-value	Levenes Test Stat	Levenes P-value	Conclusion
0.964	0.283	0.554	0.734	USE PARAMETRIC TESTS

BASIC SUMMARY STATISTICS

Level	N	Mean	StdDev	StdErr	CV(%)	95% Confidence Interval
-1.000000	6	0.133000	0.030186	0.012323	22.70	0.101322, 0.164678
0.125000	6	0.138667	0.031935	0.013038	23.03	0.105153, 0.172181
0.260000	6	0.106167	0.023017	0.009397	21.68	0.082012, 0.130321
0.515000	6	0.102000	0.028844	0.011776	28.28	0.071730, 0.132270
1.020000	6	0.073167	0.037435	0.015283	51.16	0.033881, 0.112452
2.020000	6	0.042333	0.026303	0.010738	62.13	0.014730, 0.069937

Level	Median	Min	Max	% of Ctrl (means)	% Reduction (means)
-1.000000	0.136500	0.088000	0.162000	.	.
0.125000	0.141000	0.094000	0.178000	104.3	-4.26
0.260000	0.109000	0.071000	0.139000	79.82	20.18
0.515000	0.095000	0.077000	0.147000	76.69	23.31
1.020000	0.067500	0.020000	0.128000	55.01	44.99
2.020000	0.029000	0.022000	0.087000	31.83	68.17

Analysis results for Variable:WEIGHT Onion
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PARAMETRIC ANALYSES - use alpha-level=0.05 for all tests

Analysis of Variance (ANOVA) - overall F-test

Numerator df	Denominator df	F-stat	P-value
5	30	8.91	<.0001

Dunnett -testing if each trt mean is significantly less than control

Williams-tests neg. trend. Check plots! TEST ASSUMES A MONOTONICALLY DECREASING DOSE RESPONSE.

Level	Mean	%Reduc Ctrl (means)	Dunnett p-value	Level	Isotonic mean	Williams p-value
Ctrl	0.133000	.	.	Ctrl	.	.
0.125000	0.138667	-4.26	0.912	0.125000	0.135833	0.565
0.260000	0.106167	20.18	0.205	0.260000	0.106167	0.077
0.515000	0.102000	23.31	0.139	0.515000	0.102000	0.051
1.020000	0.073167	44.99	0.004	1.020000	0.073167	<.001
2.020000	0.042333	68.17	<.001	2.020000	0.042333	<.001

RESULTS SUMMARY

	NOAEC	LOAEC
Dunnetts Test	0.515	1.02
Williams Test	0.515	1.02

MSD=The minimum diff Dunnett's was able detect as being statistically significant at .05

MSD: 0.04 %Change from ctrl the MSD represents: 30.37

PARAMETER ESTIMATES FROM NONLINEAR MODELING

NOTE: Convergence criterion met.

WARNING: Do NOT report values below if convergence failed or convergence problems were noted.

Note that convergence does not necessarily mean a good model fit and/or good estimates!

LOOK AT GRAPHS! DO ESTIMATES MAKE SENSE? ICx estimates that fall outside the range of concentrations tested (along with their slope and CIs) are not likely to be reliable.

	Estimate	LowerCL	UpperCL
IC50	1.1157773	0.6900799	1.8040794
IC25	0.4715506	0.1995332	1.1144008
IC10	0.2171983	0.0600513	0.7855794
IC05	0.1365795	0.0289611	0.6441046

Slope	(LowerCl	UpperCl)
1.8032	1.1277	4.4966

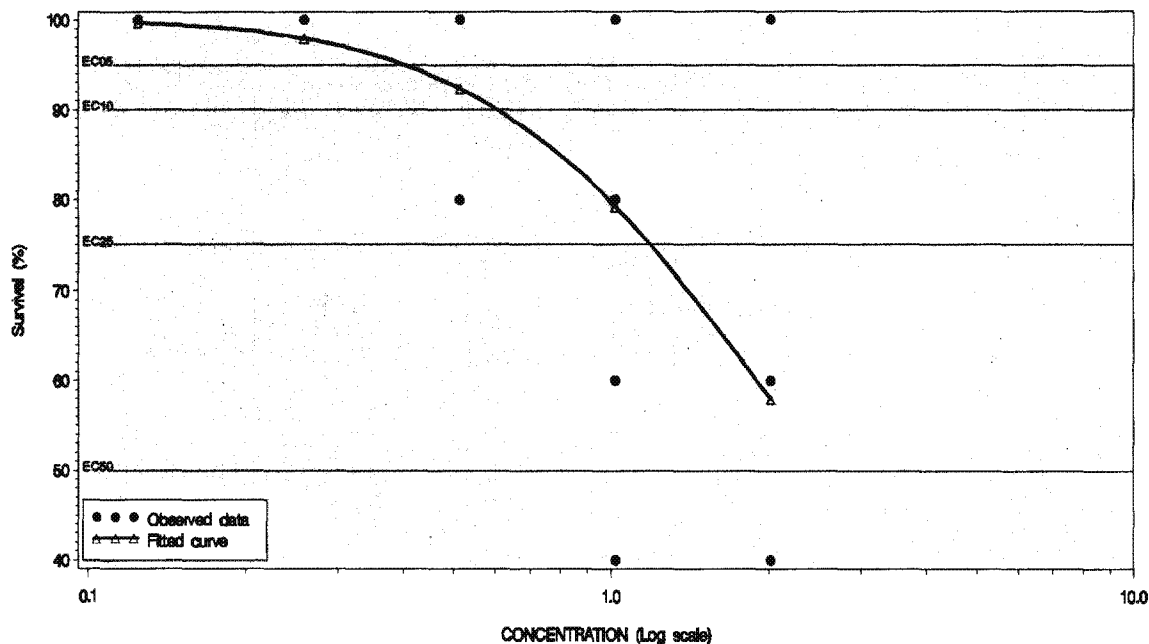
OBSERVED vs PREDICTED TREATMENT GROUP MEANS

Level	N	Observed Mean	Predicted Mean	(Obs-Pred)	Pred % of Ctrl	Pred % Reduc from Ctrl
-1.000000	6	0.13	0.14	-0.00	101.58	-1.58
0.125000	6	0.14	0.13	0.01	97.19	2.81
0.260000	6	0.11	0.12	-0.01	88.68	11.32
0.515000	6	0.10	0.10	0.00	73.91	26.09
1.020000	6	0.07	0.07	0.00	53.64	46.36
2.020000	6	0.04	0.04	-0.00	32.61	67.39

Survival (%) Effect Concentrations (ECx) for Onion

VEGETATIVE VIGOR (Dicamba) 029801 47815102 (SAS v9.2, Sprouts v1.0) 12JAN2010

Fitted values adjusted against baseline control mortality



Analysis results for Variable: PERCENT_SURVIVE Onion

(SAS v9.2, Sprouts v1.0) VEGETATIVE VIGOR (Dicamba) 029801 47815102 12JAN2010

Comparing Control vs. Inactive Ingredient

Class	N	Mean	LowerCL	UpperCL	StdDev	StdErr	Minimum	Maximum
Control	6	100.0	100.0	100.0	0	0	100.0	100.0
Inactive	6	100.0	100.0	100.0	0	0	100.0	100.0
Diff (1-2)	0	0	0	0	0	0	—	—

TESTS OF ASSUMPTIONS FOR PARAMETRIC ANALYSIS

Shapiro-Wilks test for Normality of Residuals --- alpha-level=.01

Levenes test for homogeneity of variance (absolute residuals) -- alpha-level=.05

Use parametric analysis if neither test rejected, otherwise non-parametric analyses.

Shapiro-Wilks Test Stat	Shapiro-Wilks P-value	Levenes Test Stat	Levenes P-value	Conclusion
0.829	<.001	5.310	0.001	USE NON-PARAMETRIC TESTS

BASIC SUMMARY STATISTICS

Level	N	Mean	StdDev	StdErr	CV(%)	95% Confidence Interval
-1.000000	6	100.0	0.00	0.00	0.00	. , .
0.125000	6	100.0	0.00	0.00	0.00	. , .
0.260000	6	100.0	0.00	0.00	0.00	. , .
0.515000	6	90.00	10.95	4.47	12.17	78.50 , 100.0
1.020000	6	73.33	20.66	8.43	28.17	51.66 , 95.01
2.020000	6	63.33	19.66	8.03	31.05	42.70 , 83.97

Level	Median	Min	Max	%of Ctrl(means)	%Reduction(means)
-1.000000	100.0	100.0	100.0	.	.
0.125000	100.0	100.0	100.0	100.0	0.00
0.260000	100.0	100.0	100.0	100.0	0.00
0.515000	90.00	80.00	100.0	90.00	10.00
1.020000	80.00	40.00	100.0	73.33	26.67
2.020000	60.00	40.00	100.0	63.33	36.67

Analysis results for Variable: PERCENT SURVIVE Onion
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NON-PARAMETRIC ANALYSES - use alpha-level=.05 for all tests

Kruskal-Wallis test - testing if at least one group differs signif. from others

Exact p-value Conclusion

<.0001 At least one group differs

Mann-Whitney-Wilcoxon (NO Bonf. adj) - test if each trt is signif. less than control

Jonckheere - Check plots! Test assumes a monotonically decreasing response. Testing neg. trend

Level	Median	%Reduc Ctrl (medians)	MannWW Exact p (NO Bonf)	Level	Median	Jonckheere p-value
Ctrl	100.0	.	.	Ctrl	100.0	.
0.125000	100.0	0.00	1.000	0.125000	100.0	.
0.260000	100.0	0.00	1.000	0.260000	100.0	.
0.515000	90.00	10.00	0.091	0.515000	90.00	0.008
1.020000	80.00	20.00	0.008	1.020000	80.00	<.001
2.020000	60.00	40.00	0.008	2.020000	60.00	<.001

RESULTS SUMMARY	NOAEC	LOAEC
Mann Whitney Test	0.515	1.02
Jonckheere-Terpstra Test	0.26	0.515

PARAMETER ESTIMATES FROM PROBIT ANALYSIS

Note: Baseline mortality correction factor used in estimating ECx values

Note: Algorithm converged.

WARNING: Do NOT report values below if convergence failed or convergence problems were noted.

Note that convergence does not necessarily mean a good model fit and/or good estimates!

LOOK AT GRAPHS! DO ESTIMATES MAKE SENSE? ECx estimates that fall outside the range of concentrations tested (along with their slope and CIs) are not likely to be reliable.

	Estimate	LowerCL	UpperCL
EC50	2.5220656	1.7034518	6.0119392
EC25	1.1897451	0.8577037	1.7843682
EC10	0.6050226	0.3287896	0.8412160
EC05	0.4036589	0.1649932	0.6021523

Slope (LowerCl, UpperCl)

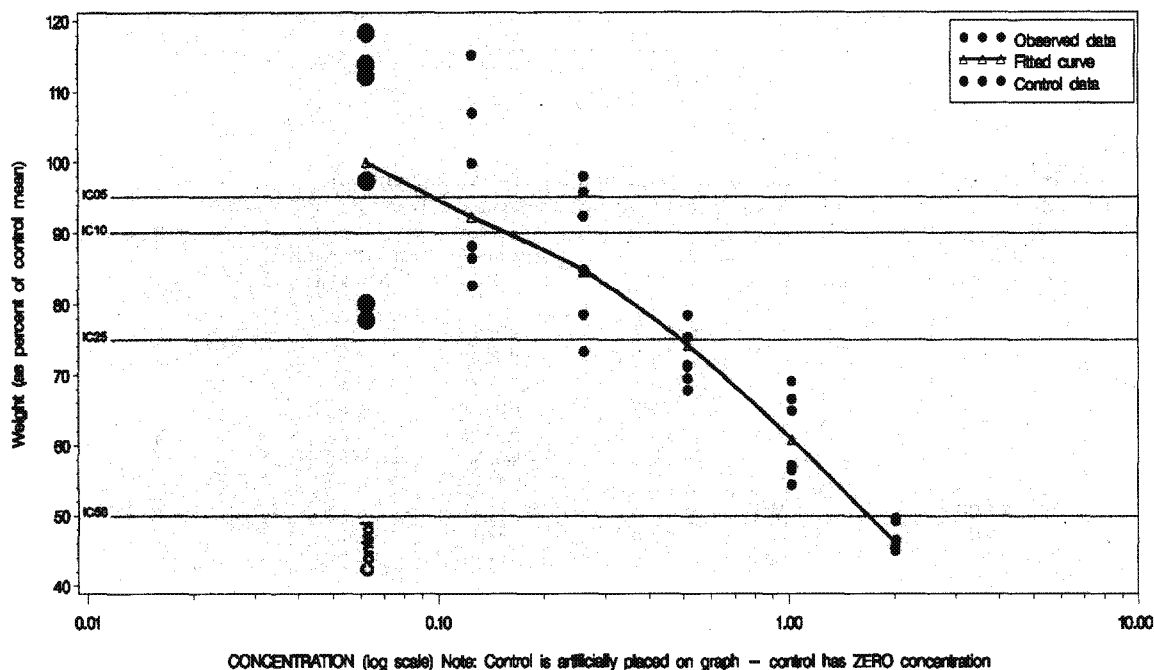
116.6996 13.2138 1030.6502

OBSERVED vs PREDICTED TREATMENT GROUP MEANS

Level	N	Observed Mean	Predicted Mean	(Obs-Pred)	Pred % of Ctrl	Pred % Reduc from Ctrl
-1.000000	.	100.00	.	.	.	.
0.125000	6	100.00	99.65	0.35	99.65	0.35
0.260000	6	100.00	97.93	2.07	97.93	2.07
0.515000	6	90.00	92.31	-2.31	92.31	7.69
1.020000	6	73.33	79.18	-5.85	79.18	20.82
2.020000	6	63.33	57.90	5.44	57.90	42.10

Weight Inhibition Concentrations (ICx) for Wheat

VEGETATIVE VIGOR (Dicamba) 029801 47815102 (SAS v9.2, Sprouts v1.0) 12JAN2010



Analysis results for Variable: WEIGHT Wheat

(SAS v9.2, Sprouts v1.0) VEGETATIVE VIGOR (Dicamba) 029801 47815102 12JAN2010

Comparing Control vs. Inactive Ingredient

Class	N	Mean	LowerCL	UpperCL	StdDev	StdErr	Minimum	Maximum
Control	6	0.9550	0.7776	1.1324	0.1690	0.0690	0.7440	1.1300
Inactive	6	0.9190	0.7787	1.0593	0.1337	0.0546	0.6640	1.0240
Diff (1-2)	—	0.0360	-0.1600	0.2320	0.1524	0.0880	—	—

TESTS OF ASSUMPTIONS FOR PARAMETRIC ANALYSIS

Shapiro-Wilks test for Normality of Residuals --- alpha-level=.01

Levenes test for homogeneity of variance (absolute residuals) -- alpha-level=.05

Use parametric analysis if neither test rejected, otherwise non-parametric analyses.

Shapiro-Wilks Test Stat	Shapiro-Wilks P-value	Levenes Test Stat	Levenes P-value	Conclusion
0.985	0.884	8.705	<.001	USE NON-PARAMETRIC TESTS

BASIC SUMMARY STATISTICS

Level	N	Mean	StdDev	StdErr	CV(%)	95% Confidence Interval
-1.000000	6	0.955000	0.169038	0.069010	17.70	0.777605, 1.132395
0.125000	6	0.922333	0.123083	0.050248	13.34	0.793165, 1.051501
0.260000	6	0.832000	0.094522	0.038588	11.36	0.732805, 0.931195
0.515000	6	0.690667	0.037686	0.015385	5.46	0.651117, 0.730216
1.020000	6	0.587000	0.058648	0.023943	9.99	0.525453, 0.648547
2.020000	6	0.454333	0.020646	0.008429	4.54	0.432666, 0.476000

Level	Median	Min	Max	%of Ctrl(means)	%Reduction(means)
-1.000000	1.001000	0.744000	1.130000	.	.
0.125000	0.898000	0.790000	1.100000	96.58	3.42
0.260000	0.846000	0.700000	0.936000	87.12	12.88
0.515000	0.681000	0.648000	0.750000	72.32	27.68
1.020000	0.583000	0.520000	0.660000	61.47	38.53
2.020000	0.457000	0.430000	0.474000	47.57	52.43

Analysis results for Variable: **WEIGHT Wheat**

NON-PARAMETRIC ANALYSES - use alpha-level=.05 for all tests

Kruskal-Wallis test - testing if at least one group differs signif. from others

Exact p-value Conclusion

<.0001 At least one group differs

Mann-Whitney-Wilcoxon (NO Bonf. adj) - test if each trt is signif. less than control

Jonckheere - Check plots! Test assumes a monotonically decreasing response. Testing neg. trend

Level	Median	%Reduc Ctrl (medians)	MannWW Exact p (NO Bonf)	Level	Median	Jonckheere p-value
Ctrl	1.001000	.	.	Ctrl	1.001000	.
0.125000	0.898000	10.29	0.469	0.125000	0.898000	0.436
0.260000	0.846000	15.48	0.120	0.260000	0.846000	0.085
0.515000	0.681000	31.97	0.002	0.515000	0.681000	<.001
1.020000	0.583000	41.76	0.001	1.020000	0.583000	<.001
2.020000	0.457000	54.35	0.001	2.020000	0.457000	<.001

RESULTS SUMMARY	NOAEC	LOAEC
Mann Whitney Test	0.26	0.515
Jonckheere-Terpstra Test	0.26	0.515

PARAMETER ESTIMATES FROM NONLINEAR MODELING

NOTE: Convergence criterion met.

WARNING: Do NOT report values below if convergence failed or convergence problems were noted.

Note that convergence does not necessarily mean a good model fit and/or good estimates!

LOOK AT GRAPHS! DO ESTIMATES MAKE SENSE? ICx estimates that fall outside the range of concentrations tested (along with their slope and CIs) are not likely to be reliable.

	Estimate	LowerCL	UpperCL
IC50	1.6832337	1.2800403	2.2134269
IC25	0.4907676	0.3046487	0.7905920
IC10	0.1618432	0.0745047	0.3515650
IC05	0.0833274	0.0317101	0.2189667

Slope	(LowerCl	UpperCl)
1.2601	0.9676	1.8060

OBSERVED vs PREDICTED TREATMENT GROUP MEANS

Level	N	Observed Mean	Predicted Mean	(Obs-Pred)	Pred % of Ctrl	Pred % Reduc from Ctrl
-1.000000	6	0.96	0.97	-0.01	101.56	-1.56
0.125000	6	0.92	0.89	0.03	93.70	6.30
0.260000	6	0.83	0.82	0.01	85.99	14.01
0.515000	6	0.69	0.72	-0.03	75.31	24.69
1.020000	6	0.59	0.59	-0.00	61.75	38.25
2.020000	6	0.45	0.45	0.01	46.74	53.26